FOOD INDUSTRIES

manufacturing and processing

A McGraw-Hill Publication—Established 1928

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New York, August, 1929

Volume 1 . . . Number 11

A Technical Achievement in Sugar Recovery

IF PROOF were needed of the economic value of industrial research it may be found in the achievements of that branch of the Great Western Sugar Company having to do with the recovery of first-grade sugar from molasses of an inferior grade. The best price obtainable from cattle-feed mixers and yeast manufacturers for this molasses was about $10 a ton. As the annual production by the largest of our beet-sugar companies, itself constituting about 48 per cent of our total beet-sugar production, is 45,000 tons of a molasses that is 46 per cent sugar, it is obvious that the prize held out to the technician was of attractive magnitude.

That the problem has been successfully solved is demonstrated by the fact that Dr. Dahlberg and his associates are now salvaging about three-fourths of the sugar originally held by this "discard" molasses, the salvaged sugar being sufficiently pure to be used in making fondant, for cream centers. Of the residual products the mother liquor offers possibilities for further recoveries of salts and amines that are used industrially, and the final molasses residue—about 9 per cent of the original mass—yields that most interesting sugar, raffinose, a characteristic of which is its ability to retard the crystallization of sugar solutions, and hence presumably of value to the candy maker. It now sells for $160 a pound; if sufficient demand for it were to render quantity production feasible the price would drop to approximately $3 a pound.

Thus it is seen that the work of the research department justifies itself handsomely. From each hundredweight of the original substance, worth 50c., there is being reclaimed 35 lb. of sugar, worth $1.75, to which is to be added the income from potassium salts and methyl amines, and the even more valuable raffinose.

Exporting Our Surplus Fruit

A RECENT bit of special correspondence from Los Angeles appearing in the New York *Times* quoted Paul Busch, assistant to the Mayor of Berlin, as authority for the statement that his associates in the German Reich stand ready to formulate reciprocal arrangements having for their objective greater consumption of fresh fruits by the population of the trading area centering in the German capital. Spurred on by the realization that the present German diet is deficient in fresh fruits, the authorities of its metropolis are planning the erection of a municipal market—larger than any now existent—of the sort in use in this country. In connection therewith Herr Busch was delegated to conduct a survey in the fruit-raising districts of this country looking toward ultimate appointment of technicians to superintend the trade that will ensue when arrangements are perfected.

All of this is highly interesting. Even if it never comes true it is of importance as indicative of a highly intelligent manner of handling a surplus. It happens that the annual needs of the Berlin area, as estimated by the Germans, is 200,000 tons, which is, at times, the amount of California's surplus production of fruits.

Without indulging in any fantastic dreams of precisely offsetting the two comparable figures, it still is the fact that this suggestion may point the way to the solution of one of our most pressing problems. If those who buy in the markets of one German city can consume the entire annual surplus of our leading fruit-growing state it would seem to be the part of wisdom to build up trade of that sort—far wiser, in our estimation, than to try to drive American consumers to eat apples rather than bananas, as was suggested at the recent tariff hearing.

Shall Insects Inherit the Earth?

OF FAR greater importance to man than the control of insect infestation in foods and in food-manufacturing establishments is the control of insects that infest agricultural crops. Only when one speaking with the voice of authority, such as Dr. Charles T. Brues, professor of economic entomology at Harvard, calls attention to the eternal warfare between the many species of life that inhabit the earth does man realize that he, too, is a biological entity irrespective of the divine spark of intelligence that has been given to him.

He is eternally at war with many other forms of life. The mosquito prevented the construction of the Nicaragua Canal and likewise the Panama Canal until it was controlled by Gorgas. Theories explaining the decline of early Roman civilization are of both moral and biological origin, and of these the more convincing is that of mosquito-borne malaria. Bubonic plague and its

relation to rat fleas is another example of the economic importance of insects.

All these, however, are mere skirmishes in the battle for existence compared to the competition between man and insects, for not only will man not eat insect-infested food but there is direct competition between man and insects for food itself. The most recent insect attacks have been by the European corn borer and the Mediterranean fruit fly—both imported pests whose advent is very recent. We must learn to live with two more enemies in our midst, in addition to the long line of previously existing ones such as lice, aphids, grasshoppers, scales, wire worms, army worms, Hessian flies, boll weevils, boll worms, and the like.

According to Doctor Brues the tendency to large-scale agriculture with vast areas continually being planted with the same crops is unsound, for it encourages the greater development of insects of types that prey on crops. He believes that it may be necessary for agriculture to undergo a marked change—to revert to smaller farms and more diversified farming as probably the one means of avoiding disaster. Many individual fortunes are at stake in Florida as a result of its most recent misfortune —a condition that may easily strike any other fruit-growing state. The rigid quarantine against Florida fruits is but a manifestation of dread of that fearful day when the insects shall have won another battle of gigantic proportions.

Entomologists are the generals who will direct man's defense, and their most valuable asset is knowledge. We hope that a properly constituted board of national and international strategy will deliberate upon the present state of the warfare between man and insects and lay out a long-range plan of combat which in the future will enable us to beat the enemy before it reaches our shores. To one who is not an entomologist it would appear that ideal strategy would involve study of means of combat of dreaded pests in their own habitats. We have known for years that the European corn borer and the Mediterranean fruit fly were a threatening menace. Would it not have been far better to study them abroad and learn their control beforehand than to wait until the insect enemy ravages field and orchard before beginning to study the counter atttack?

When Things Are "Not as They Seem"

FOR MANY CENTURIES the individual has been warned to "avoid the appearance of evil." Of late it is becoming just as important that the industrial corporation should observe this admonition. During the past few weeks there have been several new evidences that unwillingness to follow such warning may prove to be illegal as well as immoral.

The Federal Trade Commission has recently announced that slack filling of containers for spices constitutes an unfair trade practice and may not be done without violation of the law. The commission also has issued an order forbidding the so-called water-glass test as implying that a certain baking powder is superior to other brands. The Food, Drug, and Insecticide Administration of the U. S. Department of Agriculture has issued a new warning regarding the deceptive character of some labels on cans containing mixed vegetables, which improperly portray the mixture to imply a succulent state not actually represented by the contents. Another pronouncement from the same agency warns against the use of preparations which owe their flavor chiefly to cherry pits or the contained oil of bitter almonds with the implication that this flavor is due to cherry pulp or cherry juices.

There is nothing strikingly new about such pronouncements, either in spirit or in effect. It is worth while, however, for industries occasionally to review their own trade habits and see whether they themselves may not have fallen into this type of bad practice. It will be much better for an industry to correct its own bad habits than to wait for federal action. Only when there are faulty or deceptive processing or labeling procedures which the industry itself cannot correct should there arise need for such federal action.

Unfortunately, in some of the food industries there are found unreasonable or recalcitrant individuals or firms which will not "go along with the crowd." The government now affords ready means for dealing with such unreasonable parties; it is no criticism of the industry that the government enters to deal with them. But it is distinctly for the good of a group if it can with 100 per cent support take action in matters such as these without needing any outside pressure. Forward-looking men in every branch of the food business know this. They deserve the support of the rest of the industry for the mutual advantage of all—and of the public.

California Fruit Growers Should Look Into the Future

CALIFORNIA peach, pear and apricot growers who were fortunate enough to have fruit to sell this yea- reaped a harvest. Unseasonable frost destroyed about 40 per cent of the crops in the spring and the growers' associations resolved to get top prices for what fruit there was left and, furthermore, they got them. Faced with a "take-it-or-leave-it" attitude, the canners have been forced to "take it"—$80 a ton for No. 1 peaches; $50 for No. 2; $85 a ton for apricots; $75 to $85 for pears.

Now both canner and grower are wondering what is going to happen next. Millions have been spent in popularizing California's canned fruits, particularly peaches. Eighty-dollar peaches mean 30 to 40c. a No. 2½ can retail. Will the consumer buy them at this price, when pineapple from Hawaii or canned fruits from other regions are available for less? Is all the effort put behind California peaches to go for naught?

Next year there may be a bumper crop of peaches. What is going to happen then? In other seasons of heavy crops the canners have paid $20 to $25 a ton for peaches which cost nearly $30 to produce. With a market ruined by high prices and scarcity this year what is likely to be the price of canning peaches in the event of an extraordinary crop next year?

These are questions in the minds of both grower and canner, and the growers may have won a Pyrrhic victory after all. A second year of frost-ruined crops will be unusual, even in a land where the unusual is the ordinary, and prices boosted by catastrophe are short-lived and undesirable. What fruit grower wants the price of his fruit governed by the amount of the total crop ruined by frost? Next season it may be his crop that will be ruined. The present high prices are small consolation to the grower whose fruit has fallen from the tree before maturity.

There are times, and this would appear to be one of

them, when it would seem wiser not to charge "all the traffic will bear" and to consider what the future may hold. With the large carry-over of canned fruit from last year, a lower price would have given a profit to those growers who had peaches and enabled nearly normal price levels to be maintained to the consumer without risk of curtailment of demand. But with the present tactics—well, what about the future?

Hot Dog Stands

RECENT SURVEYS conducted among the roadside refreshment stands, now so common a sight to the touring motorist, show that the progressive stand owner is a man of many parts, exceeded in his commercial versatility only by the department-store keeper and the druggist. His functions include those of the restaurateur, confectioner, tobacconist, dealer in novelties and souvenirs, auto accessories, gasoline and oils, drug sundries, toilet goods, groceries, and campers' and tourists' supplies.

The somewhat similarly placed establishment, the filling station, has been characterized by Roger Babson, the prophetic statistician, as a most important retail outlet of the future. Perhaps the humble "hot dog" stand will, after all, win from its more aristocratic rival the honor of serving as the lineal descendent of the country crossroads store—that time-honored American institution where cracker-barrel philosophy is presumed to have originated.

Speaking of hot dogs, it is of interest to know that in 1927 the wayside stands served a total of more than 180,000,000 sandwiches, of which about 38 per cent were frankfurters. Total sales, exclusive of gasoline and oil, for 1928 are estimated at $244,000,000—a fairly lusty infant industry.

When "Protective" Tariff Becomes Destructive

IT WILL REQUIRE the wisdom of Solomon to unscramble the economic arguments regarding the sugar tariff and decide what is best for America as a whole. Quite apart from one's personal attitude toward the present triangle—continental U.S.A. producer, noncontiguous U.S.A. producer, and consumer—there is a secondary consideration which has entered into sugar byproduct tariff making that seems to us vastly more important than the issue which brought it into being. We refer to the Cuban cane-sugar molasses controversy.

Under conditions prevalent barely ten years ago an increase in the tariff on blackstrap molasses for making industrial alcohol undoubtedly would have benefited Lousiana cane growers and Western beet-sugar interests; but in this day of industrialization conditions change so rapidly that such tariff increases now might work to exactly the reverse effect of that intended by its promoters. It seems clearly to have been demonstrated that the large proposed increase in blackstrap duty would have driven alcohol makers not from Cuban molasses to Mid-West corn but would actually have driven the alcohol industry away from all agricultural raw materials to the adoption of synthetic chemical engineering methods, which use coal, natural gas, or petroleum as their raw materials.

Profitable manufacture and marketing of food products demands rigid economies in the plant and the most complete possible utilization of byproducts. Intercommodity competition today is so keen that unused byproducts often represent unrealized profits. Protective tariffs which tend to make byproduct recovery and utilization incomplete and inefficient are highly dangerous to those industries which they purport to protect. Modern chemical industry is so complete, so alert to new opportunity, and so ruthless in supplanting old methods (as it should be for the good of the community as a whole), that byproduct producers must watch their step with great care in such matters as tariff making. Artificial protection not based on sound interpretation of economic conditions is a boomerang which promises black eyes for him who throws.

Processed Cheese— A Triumph of Standardization

THE success enjoyed by the processed cheese industry since its birth in 1917 is another testimonial to the value of standardization and its inseparable concomitant —research. Starting from scratch in the days of the war, the industry has grown rapidly until today it is a giant that towers high above all other forms of cheese distribution. Although its founders were men without highly specialized training they were of a very inquiring turn of mind, which is but another way of saying that they believed in research, and it was but a few years before the brothers Kraft were embarked upon a well-organized and amply financed research program.

The tin can as a proper container for a sterilized product soon gave way to tinfoil as a wrapper for a loaf of a pasteurized product, together with the glass jar for some of the fancier cheeses. From the day that processed cheese first appeared on the market as a foil-wrapped loaf its larger success began. Sterilized cheese in tin cans has proved to be a transitional development.

Of importance almost equal to that of the discovery of pasteurization of cheese was the discovery that trifling amounts of emulsifiers such as sodium citrate or sodium phosphate would make immature cheese soften and flow freely without stringing in the melting kettles. It now began to be possible to blend sharp cured cheese with younger mild cheese, for until the function of emulsifiers was discovered it was extremely difficult to produce a satisfactory mild cheese.

The value of research to the processed cheese industry, however, seems to us to deserve less credit as a triumph of manufacturing technology in itself but more as an achievement in standardization of quality and convenience. To illustrate our meaning one need but refer to the lowly Limburger cheese, which once was the butt of all manner of low-brow ridicule. Today as a processed product sold in glass jars it is just beginning to receive its proper recognition by the American public as a most delectable item. Its consumption has been doubling annually for the past two years.

Uniform quality of processed cheese of a high order of excellence has emerged from the earlier welter of confused ideas as to proper qualities for blending. Anyone who has had experience with cheese in a large way knows well how near to the impossible it is to find two cheeses that are alike, but by the knowledge and care used in blending it is now possible to enjoy the high-grade synthetic uniformity that has been made possible by research.

High-Grade Sugar *Reclaimed from* Low-Grade Molasses

By H. W. DAHLBERG
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MOLASSES, the product resulting from the manufacture of either beet sugar or cane sugar, is a thick sirup containing a large percentage of sugar, together with an accumulation of non-sugars which it has been impossible to eliminate in the regular manufacturing process. The non-sugars are present in the original sugar beet and sugar cane, and consist of inorganic salts and organic compounds which prevent sugar from crystallizing out of the molasses. A true molasses therefore is a sugar sirup from which no more sugar can be recovered by simple evaporation. The composition of beet molasses and cane molasses is quite different, the latter containing large quantities of invert sugar, but as a general rule it may be stated that for each pound of non-sugar in the molasses, from 1.25 to 1.50 lb. of sugar is retained in solution.

The following is a typical analysis of a straight beet molasses, which may be called "first molasses":

	Per Cent		Per Cent
Moisture	21.00	Invert Sugar	0.06
Direct Polarization	52.08	Ash	12.17
Sugar by Inversion	50.51	Undetermined	15.41
Raffinose	0.85		

The so-called "undetermined" consists to a large extent of two nitrogenous compounds, betaine (trimethylglycocol) and glutamic acid, together with other complex organic compounds.

Since sugar cannot be recovered directly from molasses, it was necessary to resort to chemical methods, and the most successful process for the treatment of first molasses is the Steffen process, which depends on the precipitation of sugar as a calcium saccharate. In this process the molasses is first diluted with water to form a solution containing 5.5 per cent sugar, the solution then being treated with finely powdered lime at a low temperature and with rapid agitation, until nearly all the sugar is precipitated. For each 100 parts of sugar, 100 to 110 parts of active lime are required. The calcium saccharate is filtered, washed and carbonated to liberate the sugar, finally giving a juice of 87 to 90 per cent purity (purity = sugar ÷ dry substance, from which granulated sugar can be obtained).

The Steffen process is always worked in conjunction with the regular manufacture of sugar from beets, and one of the serious objections to the process is the relatively low purity of the saccharate produced, causing a reintroduction of impurities into the process. These impurities consist of a number of organic compounds which are precipitated by lime the same as sugar and which accumulate in the "second molasses" to such an extent that the yield of sugar from the Steffen process becomes too small to be profitable. When this occurs it becomes necessary to discard all of the molasses in process in the sugar factory and thus eliminate the undesirable impurities. The impurities which cause the most difficulty are raffinose and certain colloidal compounds which interfere with sugar crystallization.

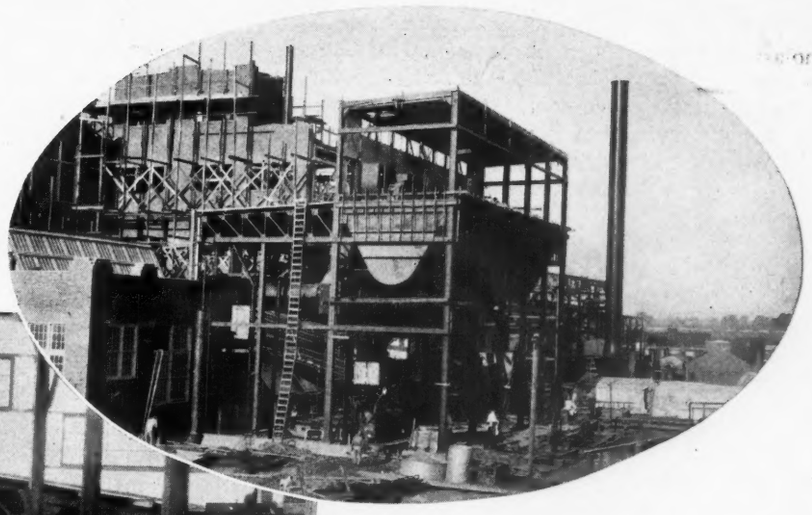
"DISCARD" HAD LIMITED OUTLET

Until very recently no economic outlet for this "discard," or "second molasses," could be found except for use in yeast manufacture or cattle feeding, for which purposes it has an approximate value of $10 per ton. The company with which I am connected produces annually 45,000 tons or more of "second molasses," and as it contains 46 to 47 per cent sugar, the problem of its most economic utilization is one of considerable magnitude. A typical analysis of this molasses, showing the concentration of raffinose compared with "first" molasses is the following:

	Per Cent		Per Cent
Moisture	21.96	Raffinose	3.70
Direct Polarization	51.02	Invert Sugar	.40
True Sugar (by enzyme)	46.00	Ash	10.87
		Undetermined	17.07

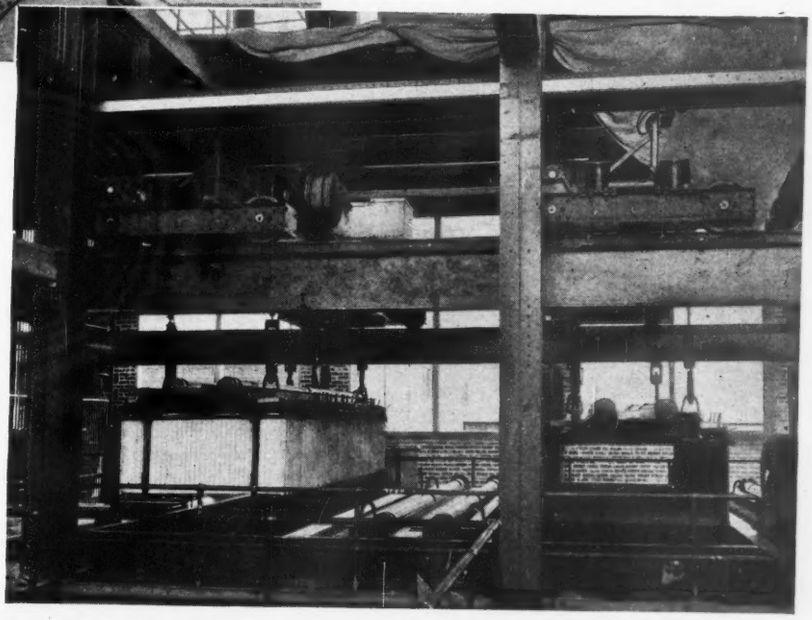
Various attempts had been made in Europe to recover sugar from molasses by some other process than the Steffen process, but the majority of them had failed, and in any event none of them was using as a raw material

Where 25,000,000 Lb. of High Quality Sugar Is Produced Annually

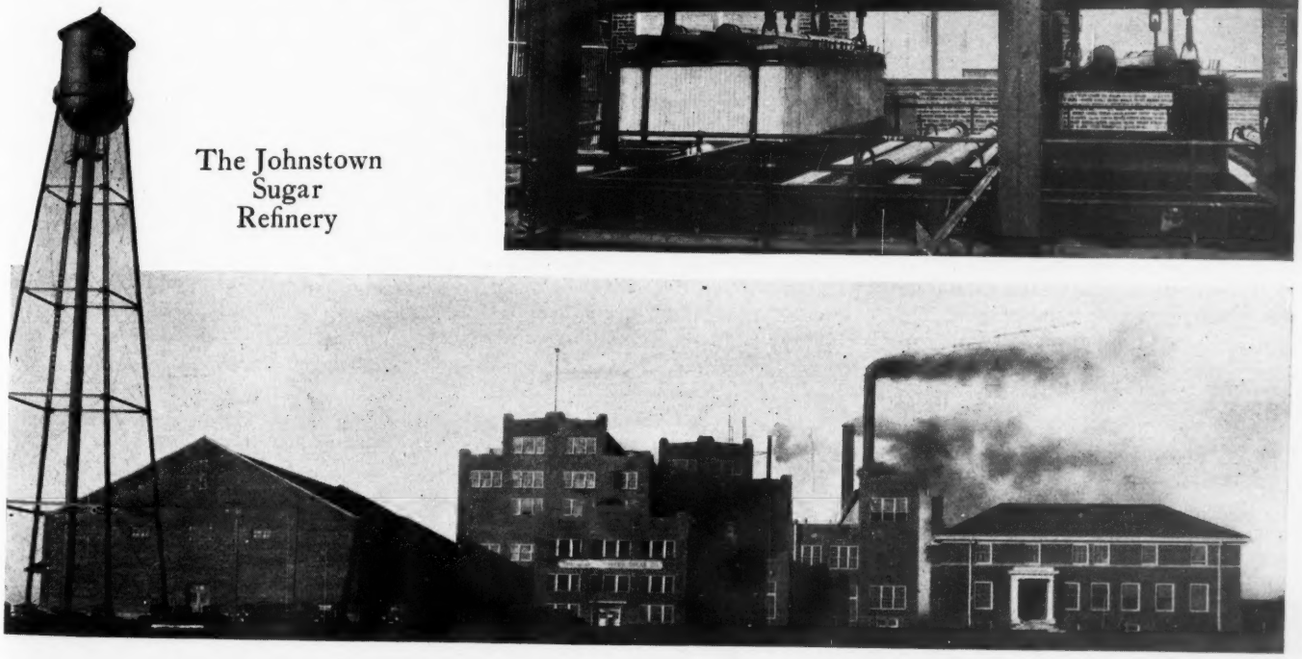


ABOVE—Refinery during construction.

LEFT—Rotary kilns used in regeneration of the active reagent.



RIGHT—Moore filter for barium saccharate.



The Johnstown Sugar Refinery

molasses of such low grade as represented by the above analysis. One large molasses plant in Germany uses a strontium process, but this is not suitable for a molasses of high raffinose content.

After a number of years' study of the whole problem by our research organization, which involved the various steps from laboratory research on through pilot-plant operation to the design of the final plant, the following decisions were reached:

1. The most suitable reagent for the precipitation of sugar from "second molasses" is barium hydroxide.
2. Since the above is such an expensive reagent, the process must be a cyclic one, with continual regeneration of the active reagent.
3. The cheapest method of regeneration for our conditions is that of burning barium carbonate in the presence of barium silicate in a rotary kiln, using fuel oil. This method of regeneration was developed in Belgium, but has not been technically or economically successful over there up to the present time.
4. In order to produce sugar at a satisfactory cost, the plant must work at least 100 tons of molasses per day and operate continually throughout the year.
5. Sugar of the very highest quality must be produced, and at least 75 per cent of the sugar present in the molasses must be recovered.

The plant as finally designed consists essentially of two parts: (a) The chemical plant for the regeneration of the reagent; (b) the sugar factory proper. The plant was built at Johnstown, Colo., and is favorably located with reference to raw materials, transportation and other features. The construction is of the modern factory type, brick and steel, and represents an investment of more than a million dollars. It is now in its third year of operation and since it is producing a high-grade food product from material of very low value, a brief description of its operations may be of interest to the food industry. It is the only plant in the world using this particular raw material and has a rather unique flow sheet.

The outstanding pieces of equipment in the chemical plant are two rotary kilns 160 ft. long and 8 ft. in diameter. Here takes place the conversion of barium carbonate to barium oxide in the presence of barium silicate, at a temperature of 1,250 to 1,300 deg. C. The successful operation of these kilns involves extremely careful chemical control, regulating the mixture fed to the kiln, the composition and physical properties of the clinker produced and the yield of active reagent obtainable.

Impurities to Be Kept at Minimum

Since the operation is a cyclic one, the composition of the kiln lining is extremely important, as any appreciable corrosion or abrasion of this lining will result in a dangerous contamination of the reagents. Certain impurities originating in the molasses, such as sulphates and lime salts, also cause unavoidable contamination and steps have to be taken to keep the concentration of these impurities at a minimum.

The product of these kilns is called "clinker," and this is ground in a ball mill, with water to give a solution of the active reagent. From the solution pure barium hydroxide crystals are obtained by cooling in continuous crystallizers of our own design. The crystals are separated from the mother liquor by filtration on a rotary Oliver filter, using Monel cloth as a filter medium. A strong solution is then prepared by dissolving the crystals in hot water and this solution serves to precipitate sugar from molasses, which operation is also done continuously. The barium saccharate obtained is filtered on a special Moore type filter, carefully washed free of the highly colored mother liquor and then decomposed with carbon dioxide gas. This gas is obtained by washing the flue gas from the boiler house.

The barium carbonate after filtration is returned to the kilns for a new cycle of regeneration, while the sugar solution is further purified and filtered. The last step in purification of the juice, after it has been evaporated to a concentration of about 50 per cent sugar, is careful filtration over bone char for the purpose of decolorization. The final juice is a high-purity product with a light straw color, and is suitable for boiling down to sugar. The remaining steps are similar to those used in all sugar factories and refineries and the final product is white granulated sugar of such a high degree of purity that it is used to meet particularly rigid specifications in the manufacture of candy and other food products. It is fully equal to any commercial granulated sugar on the market, whether made from sugar cane or sugar beets, and is especially suitable for the manufacture of fondants and high-grade chocolates.

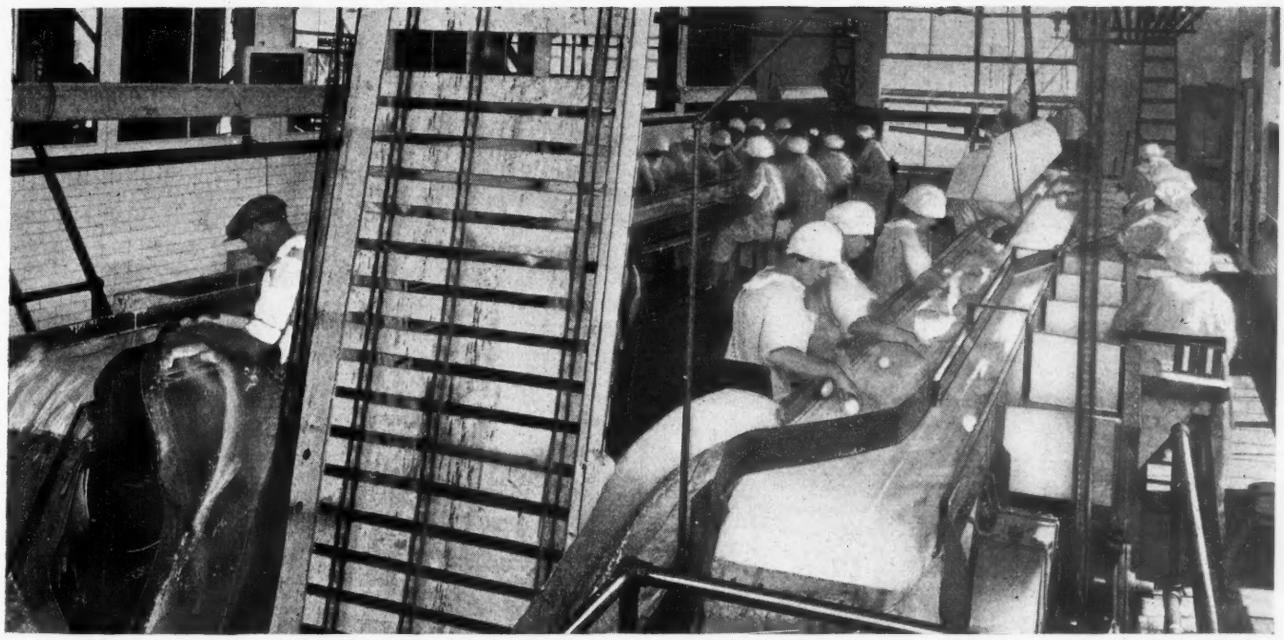
Plant Shows Modern Trend

The Johnstown plant gives employment to 200 men throughout the year and may be considered an outstanding example of present-day tendencies in converting low-grade or waste products into materials of higher value. The annual output of granulated sugar is 25,000,000 lb., or 250,000 bags of 100 lb. each, of which more than 75 per cent is used by manufacturers of food products.

It is hoped that ultimately the utilization of byproducts will be carried still further than it is at present, by recovery of chemical values from two main byproducts: (1) The mother liquor resulting from molasses treated; (2) a final molasses residue amounting to about 9 per cent of the weight of molasses treated.

The mother liquor contains large quantities of potassium sulphate, chloride, and carbonate, of which the latter is the most valuable. The process of recovering refined potassium carbonate is a rather involved and expensive one, but the industrial flow sheet has been entirely worked out in our research laboratory. The liquor also contains large quantities of methylamines, mono-, di- and tri-methylamines. At the present time the market for these products is very limited, but the tire industry gives promise of using appreciable quantities of one of the amines, and there are indications that the leather industry may use one of the others. As soon as sufficient outlets can be found for both potassium salts and the amines, the combined recovery of all of them will become a commercial possibility.

The final molasses residue contains a very interesting sugar, raffinose, $C_{18}H_{32}O_{16} + 5H_2O$. This sugar had been previously recovered in only small quantities, being made from cottonseed meal by a long and expensive process, and is quoted at a price of $160 per pound. This high price has limited its use to bacteriological work and similar uses involving small quantities, but it has desirable properties which point to its use on a larger scale. It has a very striking action in preventing or greatly slowing up the crystallization of sugar, and should therefore be of value in candy manufacture. We have worked out a procedure for its recovery in ton lots or more from the final molasses residue, and if volume outlet can be found it can be produced in large quantities to sell at $3 per pound or less.



Sprague-Sells Company Photo

A typical group at work in Dickenson & Company's corn cannery at Moron, Ill. The group bonus is very practical in this case.

Group Bonus Payments

How Efficient Teams Rather Than Individuals Are Developed by Group Compensation Plan

By WALTER C. HASSELHORN

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IF A SURVEY were to be made of the wage payment plans in effect in the canned foods industry, the returns doubtless would indicate that the majority of firms were employing the usual piece-work system of wage incentives. Many would also report the day-rate plan being in effect and several perhaps would state that they have recently installed the more modern form of group bonus.

A study of this kind no doubt would be interesting and, having seen the piece-work and day-rate plans supplanted by the group-bonus arrangement, the writer believes a discussion of the merits of the latter to be in order and timely. Not that the more advanced form of wage incentives yield benefits only to the employer in the form of reduced costs, for they also are beneficial to the employee, which is essential to labor stability.

Because of their nature, canning operations make possible a very effective and complete application of the group plan, the reasons being that they are repetitive operations of short duration, of regular and standard sequence, utilizing automatic equipment, interdispersed with manual operations that make possible convenient units of measure. Furthermore, the products are packaged in standardized containers, mechanical monitors are employed which regulate output, and definite divisions of personnel and organization are easily established.

Because of the necessity for frequent change-overs from one product to another, requiring revision in gang line-ups, it is necessary that the mechanism of the wage plan be flexible. In this respect the group plan is found to be especially advantageous as it permits reorganization of gangs, the transference of members to other groups and correctly apportioning to all a proper share of the earnings without excessive calculating, recapitulation and other clerical difficulties. This cannot be said of the piece-work arrangement because of varying wage rates, the necessity of employing a contract or gang price, and the difficulties encountered when day-rate time is interspersed with piece-work earnings.

Occupational Rating—To overcome the difficulty of varying wage rates and in order to reward each worker in direct proportion to his or her individual ability,

efficiency and accomplishment, a schedule of rates is determined which represents the rate of pay the company will award to the average experienced operator producing a satisfactory output and performing with normal proficiency. This schedule then becomes the basis of hiring and compensating all labor so classified; in the cases of inexperienced or apprentice help a lower scale is applied.

The starting point usually employed in preparation of these rates is the prevailing labor rate in the community for common labor. The crafts are then analyzed and arranged in the order of simple classes, starting with common labor as a base. For the elements found present in each craft such as skill, fatigue, apprentice period, working conditions, hazards, and the like an allowance is made, and by means of this study the operation is correctly graded and is assigned a fixed hourly rate. This rate then becomes the basis for compensating all operators so classified for the hours worked and hours earned.

Determination of Incentive Standards—Canning operations lend themselves particularly well to time study as a basis of establishing incentive standards. This study is correctly termed an engineering practice and should be employed only by one trained in advanced methods of rate setting and understanding the theory

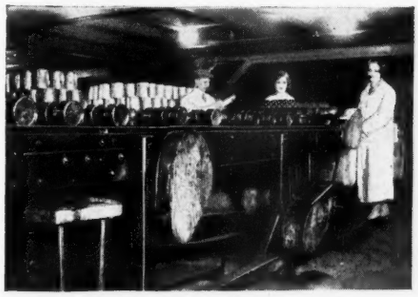
Time study observation sheet used for determining standards of production, cost and time

| | | |

underlying these methods. A sample time study of a hand labeling operation is shown opposite, and on this form are recorded the analysis of the operation: (*A*) the watch readings; (*B*) the determination of elemented time standards; (*C*) the determining and adding of allowances, and (*D*) the final computation which determines the standards of production, time and cost (*E*).

Besides determining the incentive standards, a time studying engineering practice correctly applied by a trained observer contains many other advantages, such as improvements in methods; instruction of operators; synchronizing gang line-ups, conveyors and machines; elimination of unnecessary motions and waste time; mechanization of manual operations; and conducting special investigations for the management.

Unless correctly determined, wage incentive standards can often accomplish more harm than good because rates that are set too low discourage the employees as they lack sufficient incentive, and if set too high increase labor



Making a time study of can lacquering

costs, create abnormal earnings and encourage restriction of production because of the fear of rate cutting. Standards that have been correctly determined can be guaranteed to the employees as permanent. The policy of rate cutting should not be permitted except when justified by a change in method, equipment or product.

The effectiveness and permanence of a wage-incentive plan therefore is dependent mainly on the accuracy attained in the determination and control of the wage incentive or task standards.

Design of the Wage Plan—A very important consideration in the introduction of a wage plan is the design of its mechanism. Many are of the opinion that the adoption of a wage-incentive scheme involves, first, selection of a ready-made plan and, second, its installation. In our practice we apply the principle of design and thus adapt the plan to the existing conditions, policies, and organization and thereby avoid the necessity of having the organization adapt itself to the new plan with resultant disorganization of existing functions and operations. By properly designing the system to meet

Observing jar-capping operations

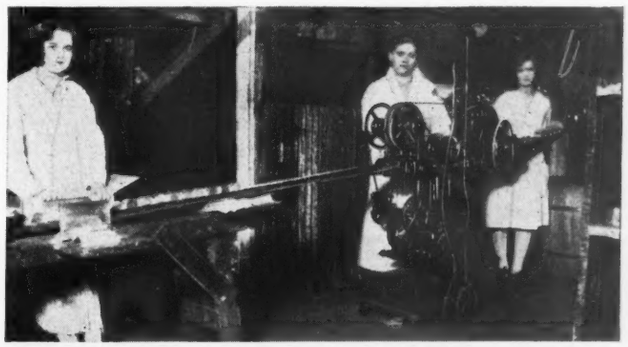
Box stitching group affords excellent opportunity for group bonus.

the requirements, as determined by a preliminary study, the maximum effectiveness of the new plan is assured. The aims sought should be simplicity and economy of operation.

Group Organization—In connection with an installation recently made in a meat canning factory the employees were organized into groups as follows:

Group No.	*Group Name*
1	Cooking and trimming
2	Stuffing
3	Retort and washing
4	Labeling machines
5	Hand labeling (individual basis)
6	Shipping and loading

By analyzing the travel of product it was found that the activities of a particular division of workers ceased



This machine-labeling group was reduced from five to three people and production increased through the application of group incentives

at the point of accumulation or storage. The segregation of the above groups was determined in that manner.

Simplicity of Operation—One of the outstanding advantages which can be credited to the piece-work system of wage incentives is its simplicity and economy of operation. However, in applying this plan where groups are concerned, the simplicity of operation is absent. A group-bonus plan, properly designed, can be operated more economically than the group-piece work, or contract, system and because of the flexibility permitted, its effectiveness is considerably increased.

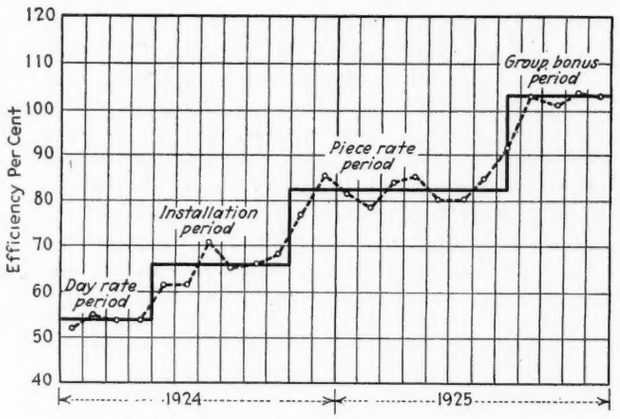
An installation of the group-bonus plan in one case required only one daily form per group (Employee's Daily Production Record) and two weekly forms per employee (Separate Bonus Check and Weekly Clock Time Card). In this case extreme simplification was

made possible by printing on the reverse side of the clock card a weekly bonus recapitulation on which the daily accomplishment was posted, expressed in decimal hours. This card then served a fourfold purpose, namely, a means of recording start and finish, recapitulation of earnings for time spent in the plant, recapitulation of bonus earnings, and a daily notification to the employee of the previous day's accomplishment. This simplified practice is applicable mainly to plants of limited size.

Supervisory and Indirect Incentives—By employing a standard unit, expressed in terms of time or production, for the measurement of accomplishment and earnings it is possible by means of formulas to derive certain data from the operation of the wage plan relative to productive efficiency and costs. For instance it is possible to determine accurately by a formula the productive efficiency of each group of employees and, by means of an additional formula, the payment of indirect incentives to the foremen and supervisors (the basis being efficiency of production labor) is made possible.

The group plan, when successfully installed, should render the following results:

1. Increased production as a result of effort stimulation created by incentive application.
2. Reduced unit-labor cost due to increased production per man-hour.
3. Reduced burden cost due to increased production absorbing prevailing burden cost.
4. Increased earnings to the employees upon exceeding the standard established as a fair day's work.
5. Improved labor stability and industrial relations by means of increased wages.
6. Elimination of unsatisfactory help by group not wanting to be retarded by drones or slackers.
7. Improved methods of operation resulting from the preliminary investigation and recommendations made in the course of time and operation study.



The effect on production of proper application of group incentives is very apparent here.

8. Improved supervision resulting from eliminating the necessity of policing employees.
9. Provide essential data for operation of cost and production systems.
10. Permit control of costs, production, effort, waste and quality, with data furnished by reports easily compiled.

The cost of operating the group-bonus plan is indeed moderate and, in one case, it was determined that the entire cost for the compilation of premium payment was 10c. per week per employee. In other words if an operator receiving 60c. per hour is saving ten minutes per week that was formerly wasted, he has paid for his share of the cost of operating the plan.

Because savings made through the application of group incentives can be correctly classed as additional net profits, this method of cost reduction should be as seriously considered by canning factory managers as have those of the automobile, rubber, meat packing and other industries.

A typical group, machine-stuffing cans with corned beef and adjusting net weight.

How 15 Years of Research Developed

Continuous Process of Manufacture

By LAURENCE V. BURTON
Assistant Editor

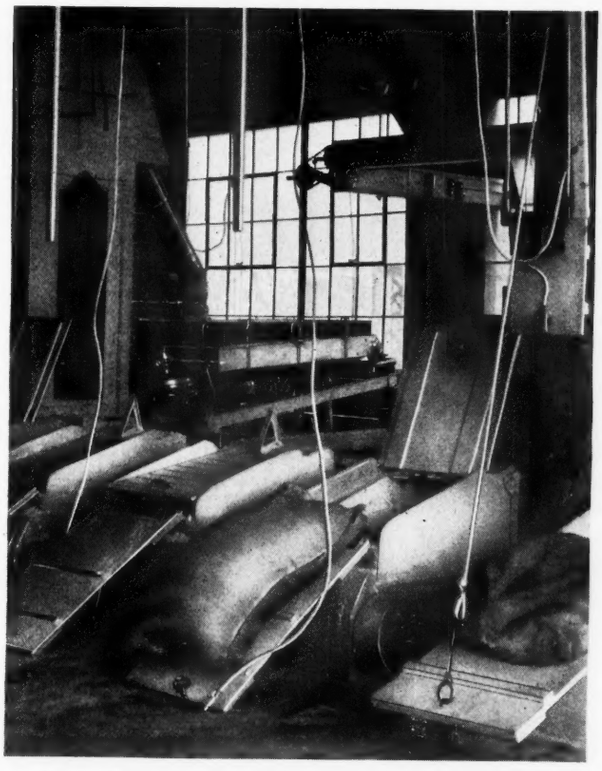


Fig. 1—Flour dumps where tapioca flour of differing characteristics is blended automatically

FIFTEEN years of uninterrupted research and experimentation were required to develop a satisfactory continuous process of manufacturing the product known to the American public as Minute Tapioca, prepared in the company's plant at Orange, Mass. It is the price the company has paid for success, and the fact that determination to succeed despite all disappointing obstacles has led to this achievement should be an inspiration to all manufacturers who face serious problems of manufacture that must be overcome in order to reduce costs and establish uniformity of quality.

Tapioca flour is manufactured from the roots of the cassava plant in Java. Before it is ready for preparation as a table food it usually is made into some kind of cooked food product such as pearl tapioca, flake tapioca, and "minute" tapioca. The flour is moistened with water and rolled into small pellets on revolving hot plates to make pearl tapioca—a process in which the cooking of the starch takes place on the exterior only, and which gives it a glazed surface which accounts for the soaking period required for pearl tapioca before it can be recooked in domestic kitchens.

Flake tapioca is cooked on hot plates and scraped off in flakes. Since it has been cooked inwardly from a hot surface it, too, has a glazed coating which slows down the rate of penetration of moisture when soaking in the kitchen. All pearl and flake tapioca is manufactured in the Orient, particularly in Java.

The American development of a quick-cooking tapioca was to eliminate the soaking period previously required for preparation of the food in the home. The earliest tapioca sold by the predecessors of the Minute Tapioca Company was ground flake tapioca. All research has been toward a method of cooking the moistened flour without producing a glazed surface. The problem presented great difficulty because of the tendency of tapioca flour to approximate the consistency of a huge gumdrop when moistened and cooked. In the early days of experimentation the various types of machine would clog completely, or shafting would be sprung, by the density of the mass that formed as soon as it was cooked. The ultimate solution has been the evolution of a continuous cooker of unusual type which not only keeps the material from agglomerating in large lumps but cooks the material in a constant stream.

The process of manufacture involves several unit operations—blending, sifting, mixing, disintegrating, cooking, drying, cooling and packaging—more than are ordinarily found in the usual food plant, and some of them, such as disintegrating, are used repeatedly during the several stages of manufacture.

Tapioca flour, obtained from a variety of foreign sources, although always pure tapioca, possesses variable characteristics, each of which must be taken into account and compensated by proper blending. This is done by using predetermined proportions of the different lots by dumping the 200-lb. sacks into the dumps shown in Fig. 1. These dumps are so arranged that the back-breaking job of dumping the heavy sacks is reduced to a minimum of effort. A shaft-driven hoist, engaged by a jaw clutch, lifts the hinged end of the dump shown in Fig. 1, the flour pours into the hopper, and a worm conveyor at the bottom of each dump delivers the flour simultaneously into the master-conveyor and thence to a flour elevator that pours it into a 6x3-ft. Rotex sifter. A second, smaller, Rotex sifter is at the right end of the dumps shown in Fig. 1.

The sifter, equipped with a 10-mesh screen over a

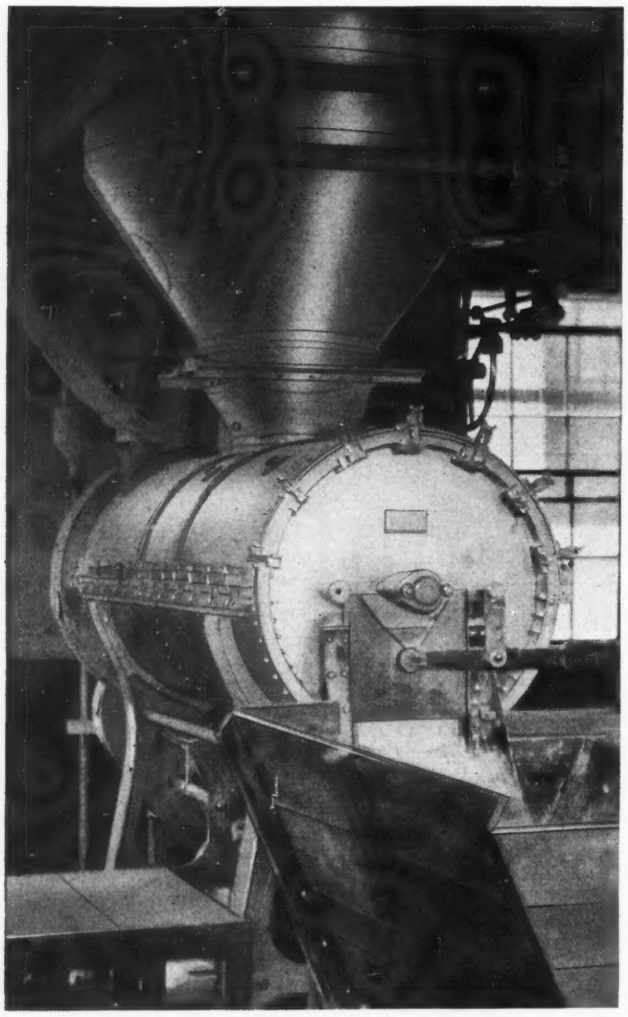


Fig. 3—A Barber-Stockwell mixer surmounted by automatic flour and water scales for dampening the tapioca flour

The Automatic Cooker Is the Heart of the Continuous Process

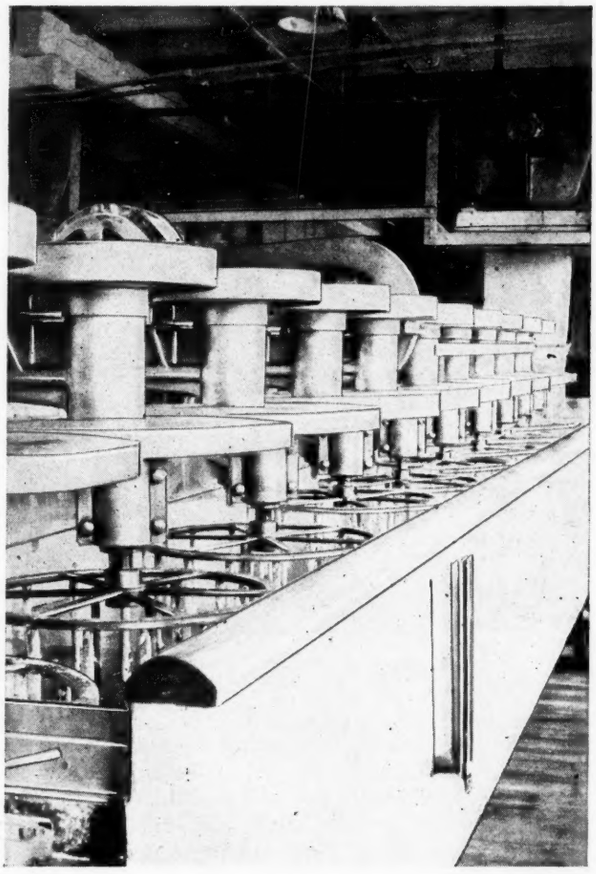


Fig. 5 — Cooker, at rest and empty, showing the construction and arrangement of the stirrers. Note the driving motor mounted with the adjustable driving head assembly and the hammer mill located above the intake end of the cooker

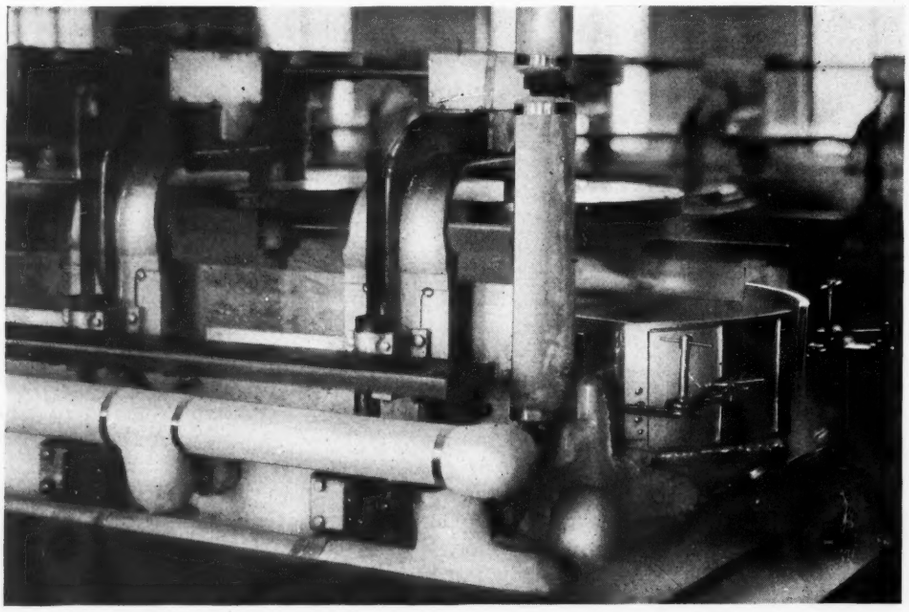


Fig. 4 — Discharge end of the continuous tapioca cooker. Note the flexible joints in steam pipes that permit titlting the whole kettle; also observe the wing gates that help to regulate the flow of material. The cooker is in operation yet very little steam is given off

60-mesh bolting cloth, removes the bag lint. The blended and bolted flour is dropped to the next lower floor, where Read automatic flour scales and water scales automatically proportion water and flour into a cylindrical mixer made by the Barber Stockwell Company. The formula is one that gives a mixture that is barely damp and contains the minimum amount of water possible to use. From the mixer the mass falls into the wooden hopper, shown in the foreground of Fig. 3, equipped in its bottom with a spiral conveyor the speed of which may be varied by a Reeves transmission to suit the needs of the subsequent operations.

Between the mixers and the cookers a Harosh mill of the hammer type breaks up the wet material into a semi-floury mass as it falls into the cookers. Without this disintegrating operation the tapioca will cook into coarse lumps and be otherwise unsatisfactory.

In the design of the cookers is found the most unusual feature of the plant, for here one of the most troublesome substances is cooked easily and continuously at the rate of 2,500 lb. per hour—a rate that can be easily increased if occasion demands. In this department is found the culmination of the success of all the years of research. The cookers, or kettles, as they are designated at this plant, are in reality a connected succession of steam-jacket kettles equipped with gyratory stirrers of unusual design. They are built in sections of cast iron about 4 ft. in length, and bolted together in a suitable frame. Each section is thus a shallow cast-iron steam-jacket kettle lined with Monel metal with the ends of the several sections all joined as is shown in Fig. 4.

Stirring the cooking mass in such a way that it is continually broken up is accomplished by the ten circu-

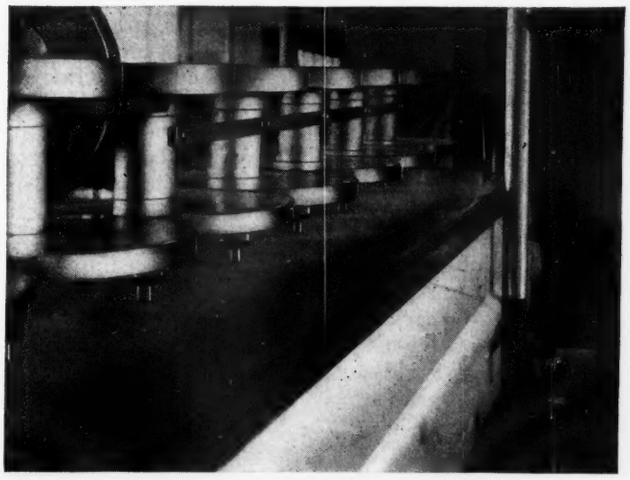


Fig. 6—Very little evaporation takes place in the cooker; here it is operating at full speed

lar gyrating stirrers. The actual stirring is accomplished by means of Monel metal pegs that extend downward but do not quite scrape the bottom, as shown in Fig. 5. Each stirring head is slidingly mounted on a device that permits simultaneous raising or lowering of all ten heads.

Gravity movement of the product through the successive units of the cookers is accomplished by tilting the cookers so that the receiving end is slightly above the level of the discharge end. This is done by means of a screw mechanism. In this manner the forward pitch

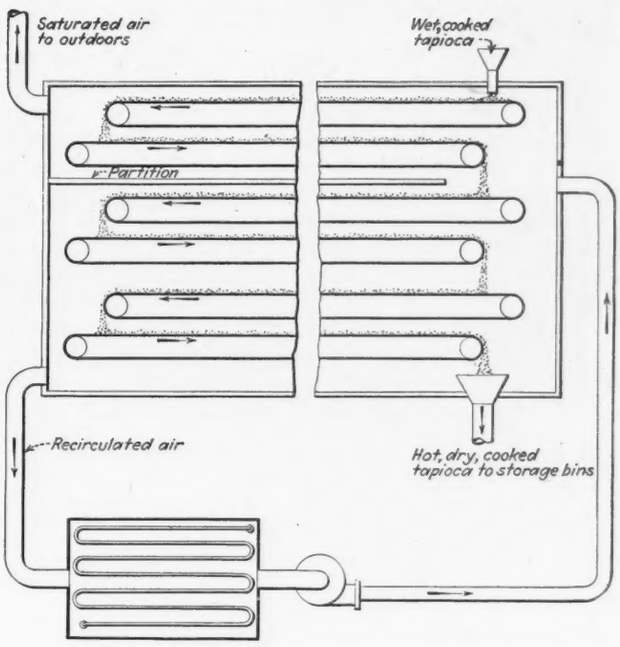
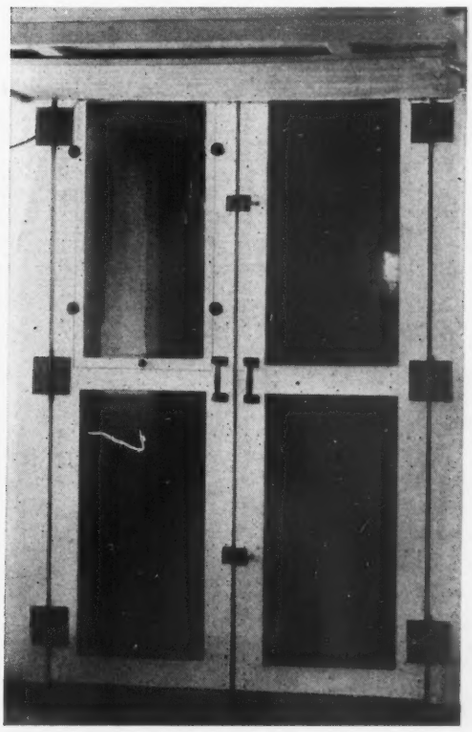


Fig. 7—Flow diagram of the drying system showing how heat economy has been effected by recirculating a part of the air. The belts are of canvas, about 100 ft. in length.

controls the velocity. The rate is changed to meet the variations of the needs of the material.

Steam at a pressure of 90 lb. is carried in the jackets. The stirrers are operated by a motor mounted on the cooker. Since the feature of tilting is embodied in the equipment the steam pipes must be made with flexible joints at three places in each pipe line, as shown in Fig.

Fig. 8—Each of the three driers is equipped with a double glass door that permits easy inspection. The ends of the conveyors are visible through the glass.

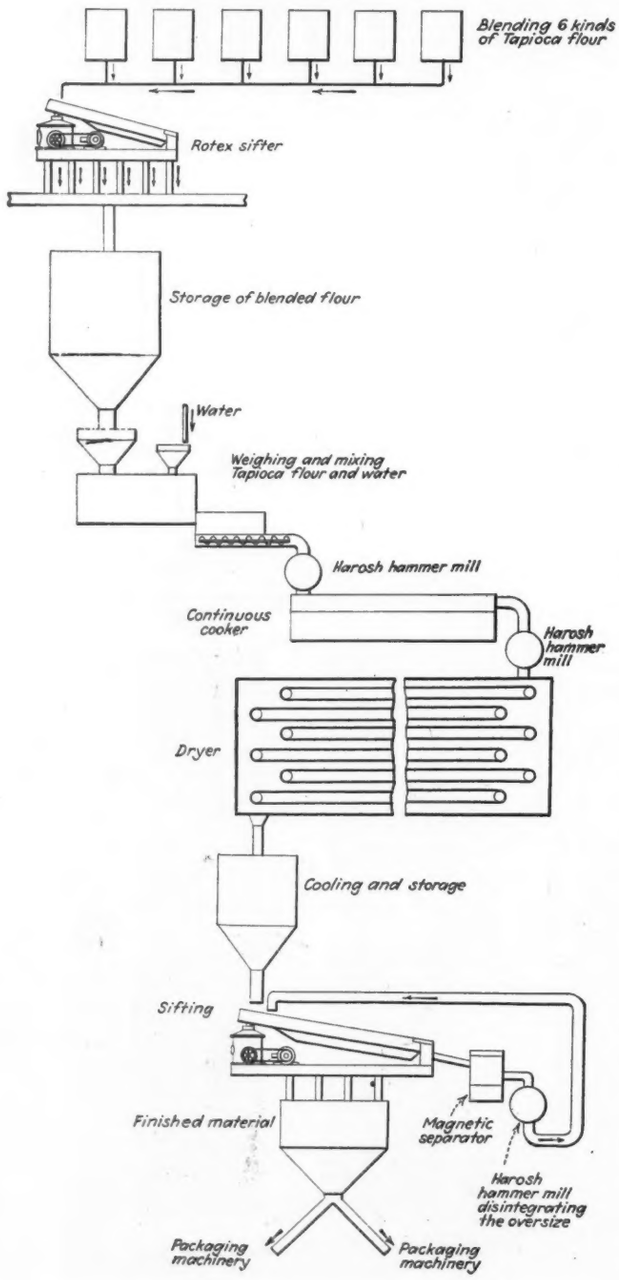


4. Armstrong traps remove the condensate from the jackets.

As the moist tapioca passes down through the successive sections of the cookers the starch becomes cooked and the material assumes a granular, translucent, gummy condition before it passes out the adjustable wing gates, seen in Fig. 4, with but comparatively little water being evaporated in this operation.

Oddly enough the next step after cooking is to disintegrate the gummy materials in a hammer mill and, unless one has seen it actually done, it might easily be classified as one of the operations that can't be done. However, it is carried out in a Harosh No. 1½ mill and a J. B. Sedbury No. 33 mill. The result gained by reducing to size the material while hot and damp instead of doing it after it is hard and dry is to avoid the formation of fine floury tapioca, which would be inevitable were it milled in a hard condition.

Fig. 9—Diagrammatic flow sheet of the process of manufacture of Minute Tapioca



At this stage of manufacture the cooked tapioca is in a fine granular condition that is damp and gummy and must be dried. The present drying equipment was developed by the manufacturing company and differs from the commoner forms of driers. There are three tunnel driers, each having a set of six canvas conveyor belts arranged as shown in Fig. 7.

The end of one of the driers is shown in Fig. 8. Hot air from a basement air heating plant is circulated in one direction through the driers, entering at 225 deg. F. and leaving at 175-180 deg. F. A partition, shown in Fig. 7, diverts the saturated air in the upper two spaces from the main stream and forces it out of doors. The hot air in the four lower spaces is not completely saturated with moisture and is recirculated. The heating coils comprise 11,000 lineal feet of 1-in. pipe and carry steam at 35 lb. pressure.

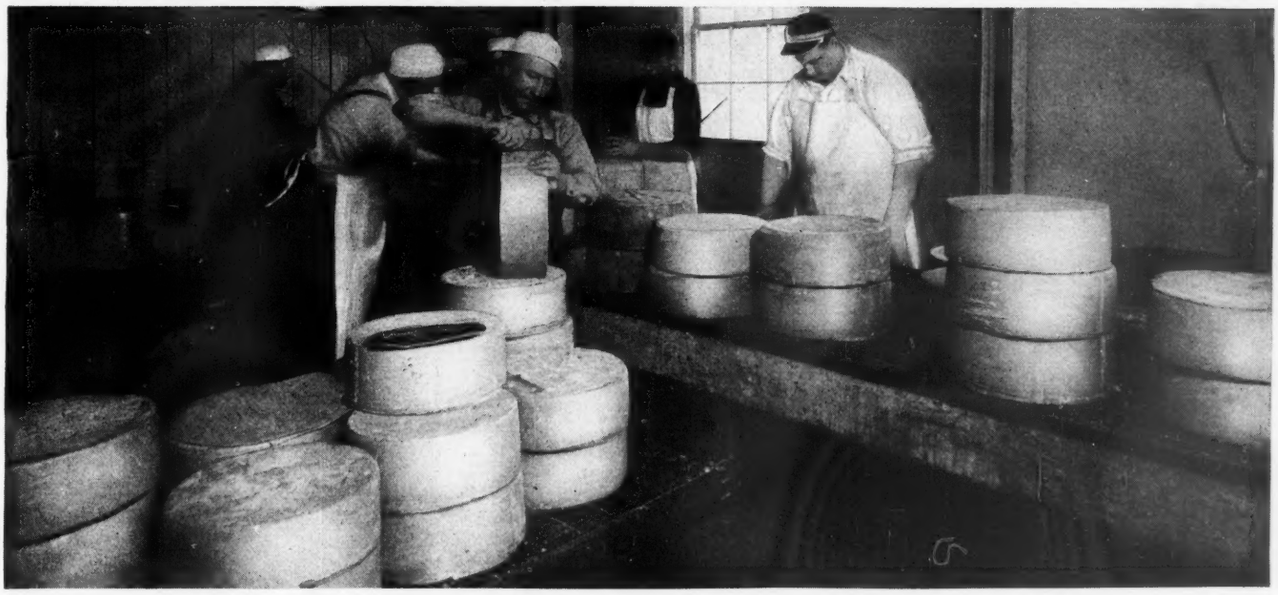
Falling from the end of the last drying belt the hot dried tapioca is now conveyed by a bucket elevator to storage bins for cooling, after which it is given a final sifting and sizing preparatory to packaging. The considerable number of such storage bins also affords a reservoir of material that may be filled or drawn upon as subsequent operations require.

The final sizing of the product is carried out in a unit comprised of a 6x3-ft. Rotex sifter operating in a closed circuit with a Harosh No. 1½ mill. The oversized material from the sifter passes through a Dings magnetic separator for removal of any tramp iron before entering the mill. Comparativaly little actual, dry grinding is done here because of the effectual disintegrating of the wet material immediately after cooking.

From the sifting and grinding operations the tapioca, now dry and cooled, passes to the three filling lines. The equipment used here successively is the style C bottom sealer made by F. W. Bird & Son for sealing the bottoms of the cartons; coupon inserters made by the Pneumatic Scale Company that insert a coupon in the empty carton, placing it flat on the bottom; automatic weighing machines made by the Bond Scale Company; and sealers for the tops of the cartons, made by the Bird Machine Company. A feature of the last machine is a small embossing dater built especially for this job by Miller & Crowninshield that embosses a coded date mark on the flap of each carton as it passes this station. Cartons are hand-packed, to insure proper inspection, into shipping cases which are sealed on a full automatic top and bottom Standard box sealer.

Quality control is an important factor in the operation of this plant, for although, like macaroni and a number of other apparently simple types of manufacture, the process appears to be nothing but mixing flour and water, cooking, drying and sizing, it presents many opportunities for variations that must be watched continually. Hourly laboratory tests are made of raw materials by which the proper blends are determined; pH is tested regularly and adjusted where necessary, as are all the various other factors of temperature, moisture, siftings and the like.

Another very important feature of the operation of this plant is that of research, for, although fifteen years of effort was devoted to development of the continuous cooker, there is no let-up on studies of operating problems. The present research program involves study of drying with a view of accomplishing it more rapidly and more cheaply; also a study of the exact nature of the conditions and changes involved while cooking the tapioca flour.



Trimming cheese preparatory to grinding and processing in plant of Lakeshire Cheese Company.

Sales of CHEESE *Increasing*

Through Convenience and Keeping Quality Due to

PACKAGING

By H. H. SOMMER
Professor of Dairy Husbandry
University of Wisconsin

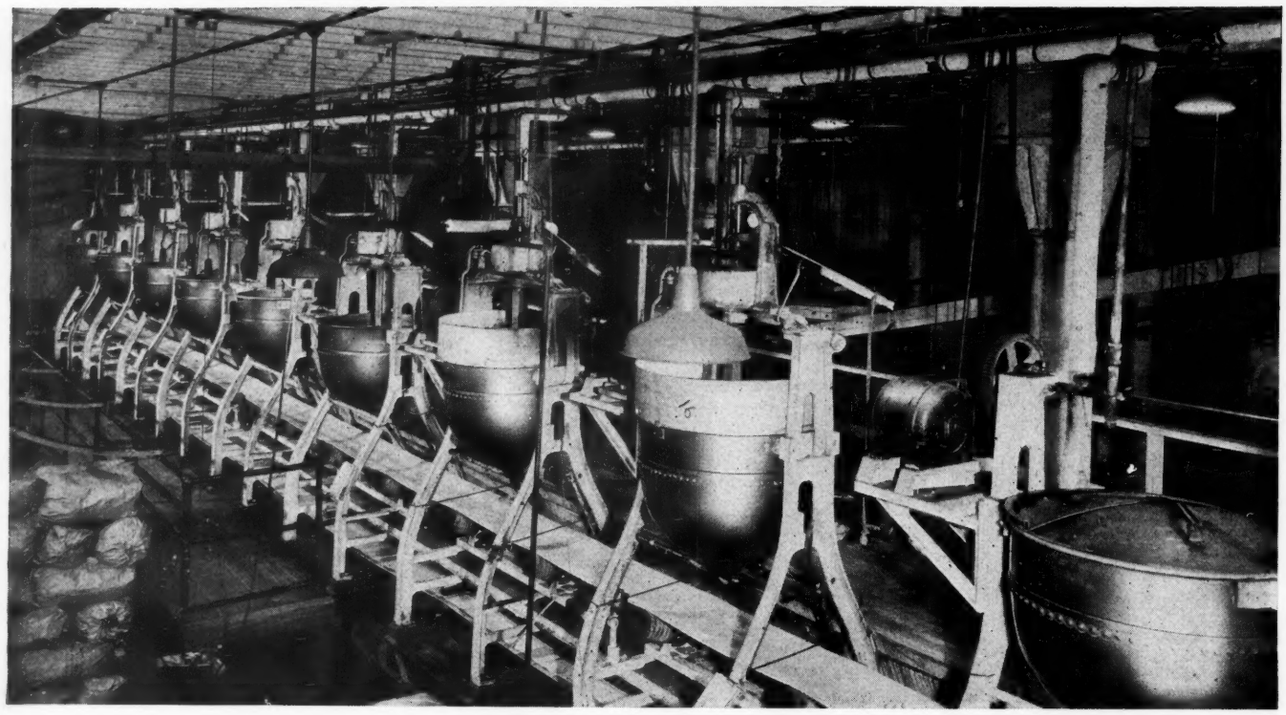
CHEESE in some form has been an article of diet for many centuries wherever milk has been produced. The different methods of making cheese in the various dairy communities in each case led to a product of a characteristic flavor, odor, texture, color and keeping quality. In many cases these differences in properties were marked and so we have many kinds of cheese; various sources list over 200 varieties. The factors which contribute the differences in properties and hence create many distinctive varieties of cheese are:

1. The kind of milk used, whether cows', sheep's, or goats'.
2. The way the milk is cared for before the cheese-making process is begun.
3. The type of "starter" added to the milk.
4. Whether the curd is obtained by the action of acid or rennin.
5. The acidity developed in the curd.
6. The temperatures used in the process of making.
7. The amount of moisture retained.
8. The method of salting and quantity of salt used.
9. Conditions of curing—temperature, humidity and opportunity allowed for chance inoculation.

All of these factors are important in determining the kind of cheese produced.

The moisture content is a very important factor and differs widely in different varieties—from approximately 30 to 70 per cent. Because of its importance, cheeses are commonly classified on the basis of moisture content; those varieties commonly having a moisture content of below 40 per cent are known as "hard cheeses"; and those over 40 per cent are known as "soft cheeses." Obviously there is no sharp distinction between these two classes; some varieties commonly having a moisture content of 39 to 44 per cent may be regarded as belonging to an intermediate class—e.g., brick cheese.

The keeping quality of cheese in general varies inversely with the moisture content; the cheeses of high moisture content cure rapidly, and when they have attained their "prime" condition, must be consumed



Monel-metal, steam-jacket kettles provided with double-action agitators, used by Pabst Corporation for processing cheese. Note the belt conveyor under the kettles for conveying the product to filling machines.

within a comparatively short time; those of low moisture content cure slowly and may be kept for a long time. One instance is recorded where a cheese was 120 years old when eaten (Milchzeitung, 1910). While this is a very unusual case, it is not unusual to have a well-made Cheddar cheese aged to two or three years for those who like a well-cured cheese.

In general the high-moisture, quick-curing varieties of cheese are made into comparatively small units—e.g., Camembert and Limburger. The main reason for this is that these cheeses are cured by the action of molds and other micro-organisms growing at the surface. A further reason, no doubt, is that these cheeses must be consumed comparatively rapidly when they are once properly cured, and hence larger units would not be so suitable. The point is that with the soft cheeses there is not much of an incentive for packaging (beyond what is done at the original factory), because they are already in small units. With soft cheeses whatever packaging has been done has had as its main object the *preserving* of the cheese in its prime condition. Lesser objects are blending and presenting the cheese to the consume. in a more convenient form (rind removed and only the edible portion included in the package).

Large Units Minimize Evaporation

In general hard cheeses are made into rather large units. The main reason for this is that with the slower curing, too much loss in weight due to evaporation, and too great a decrease in the edible portion due to rind formation, would result if small units were used. Taking the two most common hard cheeses, Cheddar or American, and Emmenthaler or Swiss, as examples, the American cheese was originally put up in sizes ranging from 10 to 60 lb. and Swiss cheese from 50 to over 200 lb. More recently 5-lb. American cheese loaves have been made up at the original factory, but only to a limited extent. The proposition of putting up American cheese at the original factory into small packages is uneconomic because of the nature of the work necessary. With Swiss cheese it is utterly out of the question, as a typical Swiss cheese could not be made with the curd put up in small units. Hence we have hard cheeses put up in sizes far beyond what any household would want to buy at any one time. To make the desirability of packaged cheese apparent, it need only be added that the hard cheeses represent the bulk of the cheese industry.

The various factors that give rise to different varieties of cheese also obviously lead to an appreciable variation in the qualities of cheese of a given variety. As a result the cheese industry is constantly striving for uniformity with only partial success; the cheese made at different factories, or even at the same factory on different days, varies. This condition makes desirable a procedure which permits blending so as to produce a more uniform product.

Important Incentives to Packing

Therefore, the objects of or incentives for packaging may be summarized as follows: preserving, blending, and the making of a convenient package. With soft cheeses the first probably is the most important; with hard cheeses the first is not so important, the second and third objects being paramount.

Historically, the first attempts at packaging were made on soft cheese. There are a number of references extant on the processing and packaging of these types. In general these processes consisted of heating the cheese before or after placing it in tin cans. These processes presented some difficulties; at any rate, packaged, preserved soft cheese did not come into extensive use. It remained for the era of packaged foods to usher in the successful processing and packaging of cheese, and then it came through the medium of hard cheeses. The methods suc-

cessfully developed for hard cheeses were then applied to soft cheeses, so that now we have both quite generally available in packaged form.

In the development of packaging these three fairly distinct methods have been applied to cheese:

Cut to the desired size and wrapped in tinfoil.

Ground and macerated to a plastic mass, which is then formed and wrapped in tinfoil.

Ground and heated to form a dough-like or sirupy mass which is then allowed to flow into forms to cool and "set."

Of these three methods the last has been by far the most successful. This method will be described and commercial practices presented in considerable detail, but in passing a few words may be said about the other two methods and the difficulties encountered when they are employed.

The first of these methods was developed to a sizable commercial enterprise by a Wisconsin concern about 1914. The process was applied to American cheese. The American cheese was made up at the original factory into special cubical shaped units and, in addition, the aim was to have these cheeses as free as possible from "mechanical holes." After the cheese had been cured the rind was trimmed off and the cube cut into smaller prisms of the desired dimensions. The cheese was then wrapped in tinfoil, but the adhesion of the tinfoil had to be accomplished somehow lest mold growth take place. For this purpose each wrapped piece of cheese was placed in a form composed of six electrically heated plates so arranged that pressure could be applied to the six sides simultaneously. The object was to cause a fusion of the cheese at the surface so as to make the foil adhere. This method was successful only as long as there was no better method to compete with it. Difficulties encountered with this method were:

Lining the boxes with tinfoil preparatory to receiving the hot processed cheese. The Lakeshire Cheese Company puts up 5-lb. loaves in these boxes.

1. No blending was possible; the quality had to be controlled entirely at the original factory.

2. If the cheese was not absolutely solid—i.e., if it contained "mechanical holes" or "gas holes"—the fixed dimensions of the cut pieces led to variations in weight.

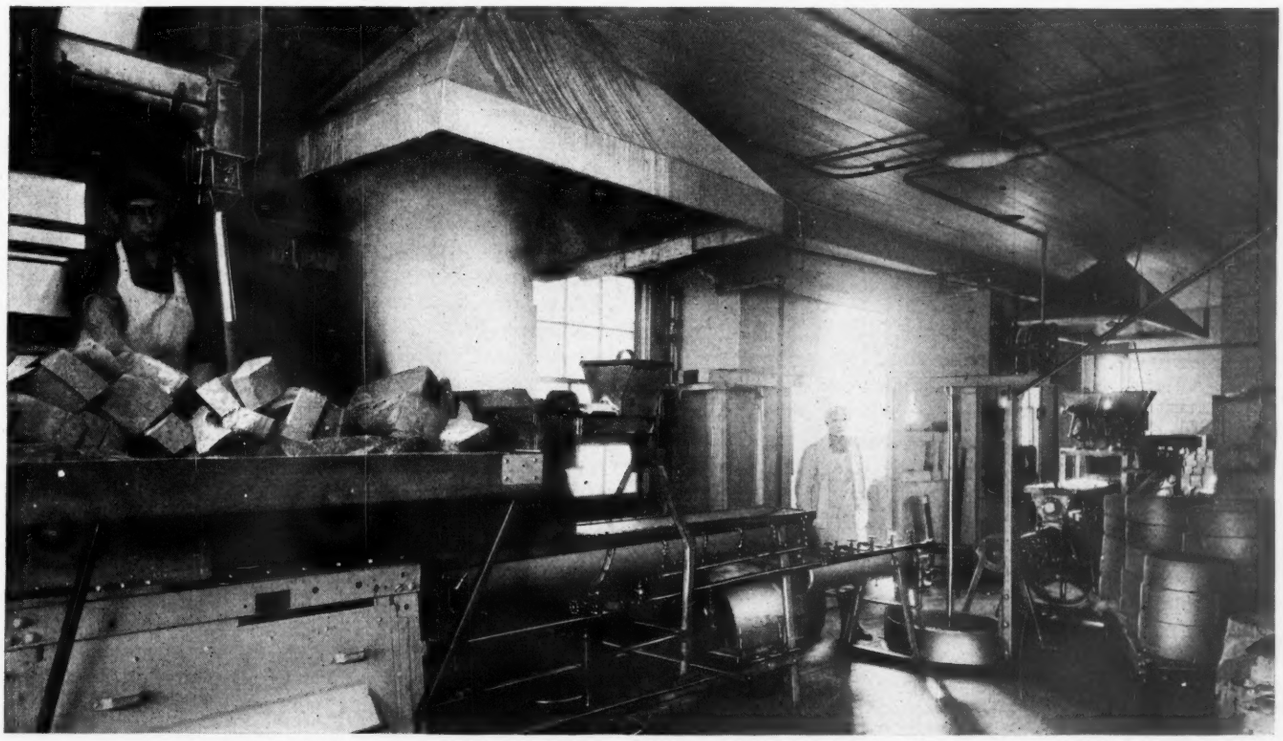
3. If the cheese had holes of any kind, air pockets would remain under the tinfoil and mold growth would occur. Obviously the process could not be applied to Swiss cheese.

4. The tinfoil was subject to a black discoloration. In spots the foil disintegrated, to be followed by mold invasion.

5. At warm temperatures the cheese was subject to fat leakage. An advantage of this method is that it brings the cheese to the consumer in its original texture. This may not be an advantage with the average consumer, but, no doubt, appeals to cheese connoisseurs.

In the second method the cheese is trimmed, ground, and macerated to a doughy mass. Water is added if necessary to effect this condition. This mass is then formed into pieces of the desired size by extruding the

Cheese-processing unit of Lakeshire Cheese Company in which the cheese is heated by live steam as it is propelled along by a worm.



cheese mass through a rectangular opening and cutting off the extruded "ribbon" at chosen intervals. Following this the pieces are wrapped in tinfoil and subjected to pressure and heat, following the same general idea as the first method. This method encountered the following difficulties: Mold growth; a gassy fermentation in many batches if the cheese was not kept under refrigeration; tinfoil discoloration; fat leakage at warm temperatures.

Both of the above two methods of packaging are still used to a limited extent although modified in some of the details.

The third method is by far the most successful and has almost completely replaced all other methods. It undoubtedly owes its success to the fact that it embodies all three objects: packaging, blending and preserving. As already indicated, in this process the cheese is reduced to a semi-fluid condition by heat, and filled into containers where it again "sets" on cooling. It is put up in loaves, jars, and tin cans. By loaf cheese is meant cheese put up inclosed in tinfoil. The procedure of making loaf process cheese is as follows:

The cheese is selected, trimmed and ground. It is then heated with suitable agitation and with the addition of certain salts, if necessary. The temperatures used range from 138 to 165 deg. F., although 145 to 150 deg. F. are most common. The desired condition of the cheese when the heating is completed, is a sirupy, plastic mass with the fat well incorporated. This plastic mass is then allowed to flow or is placed by filling machines into the empty containers that have been lined with tinfoil. The tinfoil is lapped over the opening and the container closed. The cheese is allowed to cool—not too rapidly—and after the cheese has cooled it has "set" to a body and texture somewhat resembling the original cheese. The packages most commonly used are 5-lb. and ½-lb. sizes. The varieties of cheese processed by this method are American, Swiss, brick, Limburger, and Camembert. In the case of the Camembert and Limburger cheese the packages used are ½-lb. cartons and glass jars, most commonly 6-ounce.

With this general description before us, let us now examine the various steps and their problems in greater detail.

In the selection of the cheeses, the blend must be such that we obtain the desired uniform flavor; uniform body, texture, and slicing properties; uniform color and the desired processability.

Factors which must be considered in this selection are: Flavor of the cheese, its age or ripeness, the moisture and fat contents, the reaction (acidity), and the color.

Must Prevent Disintegration

In the heating, the cheese may "disintegrate" in two characteristic ways: the milk fat may separate as a clear oil and the curdy material (proteins and protein cleavage products) retain the moisture, forming a rather tough stringy mass, or the curdy material may gather into small particles with the greater part of the moisture and fat free as a thin, milky fluid. Either condition must be avoided; the former obviously would be undesirable; the latter would lead to a very grainy and weak-bodied mass on cooling. As implied above, the desired condition is one where the curdy material retains both the water and the fat, the whole mass being smooth, homogeneous and viscous.

It is possible to obtain cheese or a blend of cheeses which will behave in such an ideal manner when heated and stirred properly. However, if only such cheese could be processed, the selection and blending would be infinitely more difficult and, at best, only a fraction of all cheese could be processed as successfully as is done at present. To relieve this situation we fortunately have the use of certain salts which aid in preventing the "disintegration" of the cheese.

The use of these salts first became known in this country through the U. S. Patents 1,389,577 and 1,374,141 by Carpenter and Eldredge, revealing the use of sodium citrate and sodium phosphate. These inventors, as the records of the Patent Office show, obtained their clue, indicating the use of inorganic salts, from the high ash content of an imported, packaged Swiss cheese. The low bacterial count of this cheese further indicated that it had been heated. There are fairly authentic records to show that such cheese was imported into this country as early as 1910.

The sodium citrate and phosphate are normal constituents of milk and cheese, and can have only a wholesome effect on the cheese as a food. Since then sodium-potassium tartrate (Rochelle salts) has also come into use for the same purpose.

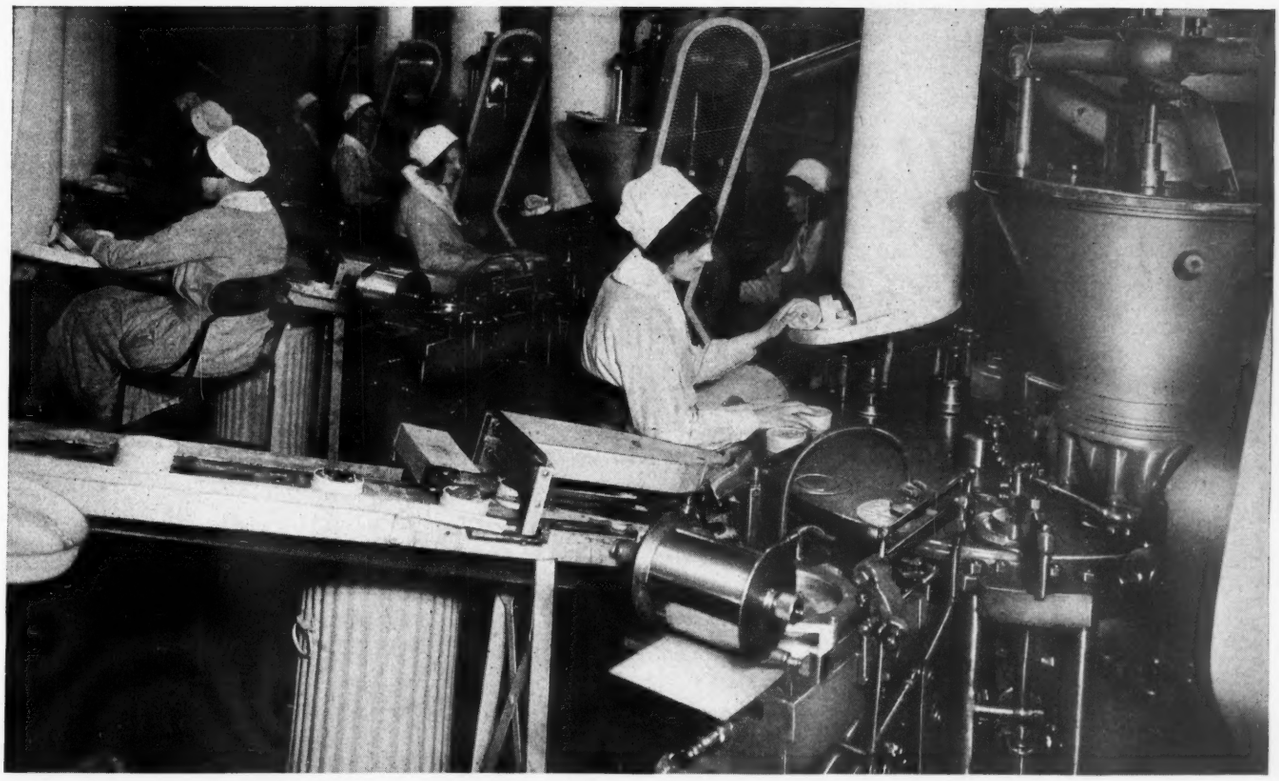
These salts are commonly known as "emulsifiers" in the process cheese industry. They are of material assistance in preventing the "disintegration" of the cheese and in attaining the ideal condition herein described. The amounts used range from a fraction of one per cent to 3 per cent. It is notable that these salts, especially the sodium citrate and phosphate, have long been recognized as casein solvents. It is likely that these salts exert their effect through their solvent action on the curdy material, causing it to be more completely hydrated and thus making it capable of emulsifying the fat. In addition, it is likely that these salts exert a more direct emulsifying effect; it is known that fat in emulsion carries a negative electric charge, and the bi-valent and trivalent anions should be effective in increasing this charge and thus facilitate emulsion.

Wider Choice With Emulsifiers

By the use of these salts the choice of cheese from the standpoint of processability is not so restricted and greater freedom is possible for selection to satisfy the requirements of uniformity of flavor, color, body, texture and slicing properties of the finished product. It is not to be inferred, however, that the question of processability can be totally ignored in the blending even when these so-called "emulsifiers" are used.

The temperature used in processing the cheese is important in a number of ways; it affects the keeping quality, body, texture, slicing properties and color of the finished product. Experience has taught that loaf cheese processed at temperatures under 145 deg. F. is likely to undergo gassy fermentation if the finished cheese is exposed to warm temperatures. Such a temperature treatment of 145-150 deg. F. reduces the bacterial count from millions per gram in the raw cheese to several hundred per gram. Under favorable conditions there is again some growth of bacteria in the processed cheese; the writer has found a decided increase in number when process loaf cheese is kept a month at room temperature.

In the making of process cheese put up in jars a somewhat higher temperature is advisable. The varieties of cheese most commonly put in jars, Camembert and Limburger, are more subject to fermentation on account of the higher moisture content. In addition, mold growth on the surface can be coped with more success-



Filling machines used by Pabst Corporation for filling special round cheese packages.

fully if a higher temperature is used. For this purpose 160 to 180 deg. F. is commonly used.

The way the cheese is allowed to cool also should be taken into consideration in the choice of processing temperatures. Tests have shown that cheese processed at 150 deg. F., put up in 5-lb. loaves, and allowed to cool as in ordinary practice will be at an effective pasteurizing temperature in the package (above 140 deg. F.) for 15 to 30 minutes. When using glass jars or smaller cartons, the cooling is likely to be more rapid, and a slightly higher processing temperature is advisable.

The cheese put up in sealed tin cans is processed in much the same manner as loaf cheese, and after the fat has been thoroughly incorporated by such treatment, the product will then stand actual sterilizing temperatures, applied after filling the processed cheese into the cans and sealing. However, because of the higher temperatures to which the cheese is subjected in sterilizing, more care must be exercised in the selection and blending of the cheese to obtain the desired processability.

As previously mentioned, the processing temperature is important also in its effect on the color and body of the cheese. Higher temperatures change the characteristic golden yellow color of American cheese to a darker and more reddish hue. Higher temperatures also usually lead to a firmer body. The reasons are the greater amount of agitation incident to reaching the higher temperatures leads to more complete emulsification of the fat, some heat coagulable nitrogenous material coagulates, and some evaporation takes place, leading to a lower moisture content.

The way the heat is applied and the agitation provided during heating are factors affecting the properties of the finished product. These factors, no doubt, are operative also through their effect upon the emulsification of the milk fat. It is known that process cheese contains the fat in a much more finely emulsified form than raw cheese. This is evident in several ways: raw cheese will suffer fat leakage at warm temperatures, whereas process cheese does not; raw cheese when heated as in a moisture test has the fat separating while process cheese retains the fat. The more thoroughly the fat is emulsified, the firmer the body of the cheese will be.

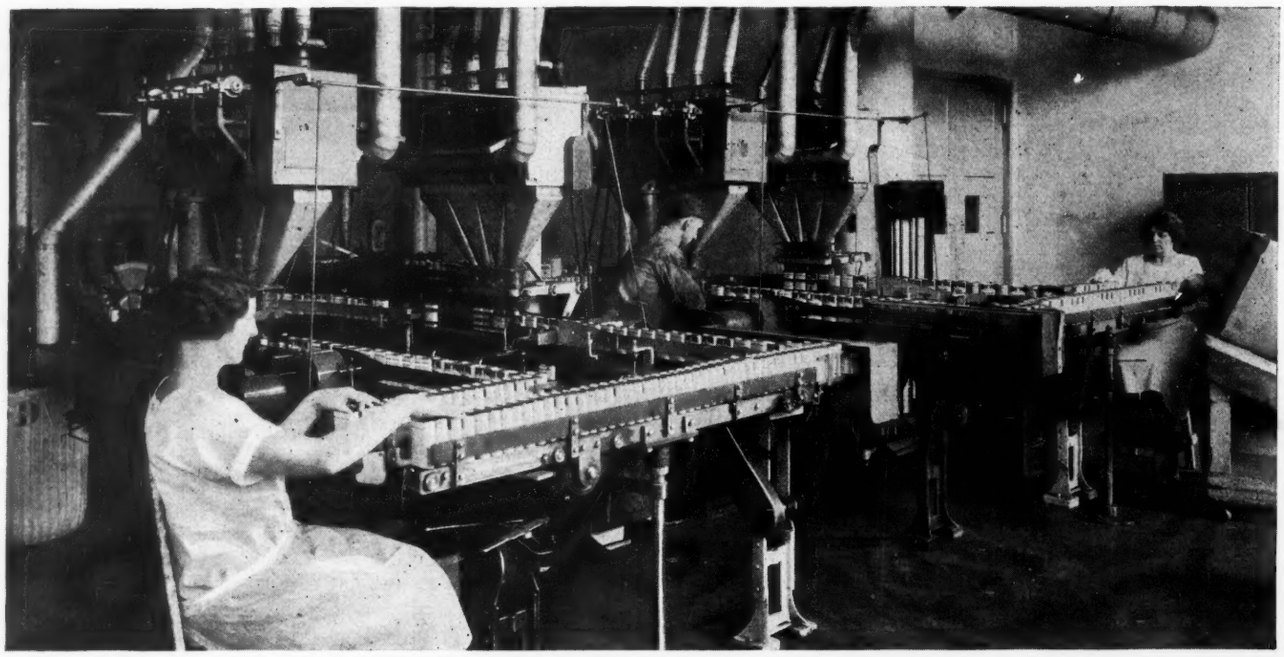
Three Types of Processing Used

In commercial practice there are three types of heating and processing methods used, apparently with equal success: (1) the method using steam jacket kettles provided with agitation, usually double-action; (2) the method in which the cheese is heated by live steam injected into the cheese as it is propelled through a suitable chamber by a worm or double worm; and (3) the method in which the cheese is subjected to a very thorough mixing (cold emulsification) first and then heated by forcing it through between closely spaced, staggered rows of pipes through which hot water is circulated. As a modification of the first method there is a method in use in Switzerland in which vacuum is applied to the cheese while it is being heated in a closed, jacketed kettle with agitators. In point of time this should be placed first, as this method apparently was in use before the process-cheese industry developed in this country.

The success of this type of packaged cheese is attested by the fact that within the comparatively few years since its introduction the sale of packaged cheese has increased from practically nothing to a point where a large percentage of cheese is sold in packaged form. It is variously estimated that in excess of 50 per cent of the total cheese in this country is sold in packaged form. The convenience of the small package, the uniformity of the product, and the greater keeping quality are important factors in this success.

Methods of Controlling Insect Infestations

2—Standard Processes of Avoiding Infestation



Unquestionably the best method of infestation control is prevention by prompt packing in sturdy containers. Here is shown insect-free Instant Postum being packed in tin—fully insured against damage by insects.

By CHARLES H. PEET
Röhm & Haas Company, Bristol, Pa.

METHODS of control of insect infestation may be grouped under three rather sharply defined classes, but it should be clearly understood that where one method is used it does not necessarily follow that neither of the other methods may not profitably be employed in conjunction with it.

1. *Physical Methods*—Probably the oldest processes of controlling insect infestation of foodstuffs may be classed as physical methods. By physical methods we shall understand those processes which involve eliminating the insect itself, its eggs or its larvae, or all of them, from the infested material by some mechanical means or operation, the prevention of infestation through the employment of some wall or barrier through which the insect cannot pass, or the actual destruction of the insect by heating, freezing or grinding.

Properly applied under conditions where such methods are applicable there is little question that this type of control is most efficient and most satisfactory. Thus coffee received free from infestation roasted, ground and packaged in tight tin containers is effectively and permanently freed from any danger of insect invasion. Flakes or bread products made from insect-free ingredients or breadstuffs and packaged in wax-tight containers which are in turn sealed with adhesive silicate in substantial paper cartons offer so serious a resistance to the entrance of insect pests that they may safely be considered insect proof so long as the quantity of insects which might attack these containers is kept within reasonable bounds.

The applicability of these physical methods to the elimination of insects already present in foodstuffs depends entirely upon circumstances. If the insect is a worm or larva which has entered boxed figs, for example, the possibility of freeing these figs of their unwelcome tenants by any mechanical method of separation obviously is practically out of the question.

Under certain conditions it is possible to wash a foodstuff free with water alone from the insect which inhabits it, but the foodstuffs which cannot be washed place their own limitation upon this procedure. Screening and blowing or fanning is a very adequate method for the removal of insects which have infested the materials, as has been described under the general heads

of superficial or intermixed infestation, but where any infestation has been followed by the deposition of adherent eggs or by the burrowing of larvae into seeds or grains or fruits it obviously is impossible to expect any such procedure to eliminate the pest. Such types of infestation can be controlled by heating and practically every variety of insect egg can be rendered sterile by heating to 120-130 deg. F. If the infested material will not be damaged by temperatures such as these and facilities are available for heating to these temperatures for the necessary period, it can be depended upon to give positive results.

It is a matter of considerable commercial interest to note that a very satisfactory device for the control of those pests which infest tobacco, and particularly those which work so much damage upon cigars, has recently been perfected and is now in successful operation in the hands of a large number of large-scale manufacturers. Reduced to simplest terms this device consists of a hollow needle or trocar which is thrust into the clipped end of the cigar to a distance only a fraction of an inch less than the length of the cigar. Through this hollow needle a jet of dry (superheated) steam is forced for a few seconds. The period of exposure is too short to damage the cigar yet it is long enough to heat the cigar too hot to be comfortably held in the hand, and extensive experiments have shown that every form of animal life within the cigar is completely destroyed.

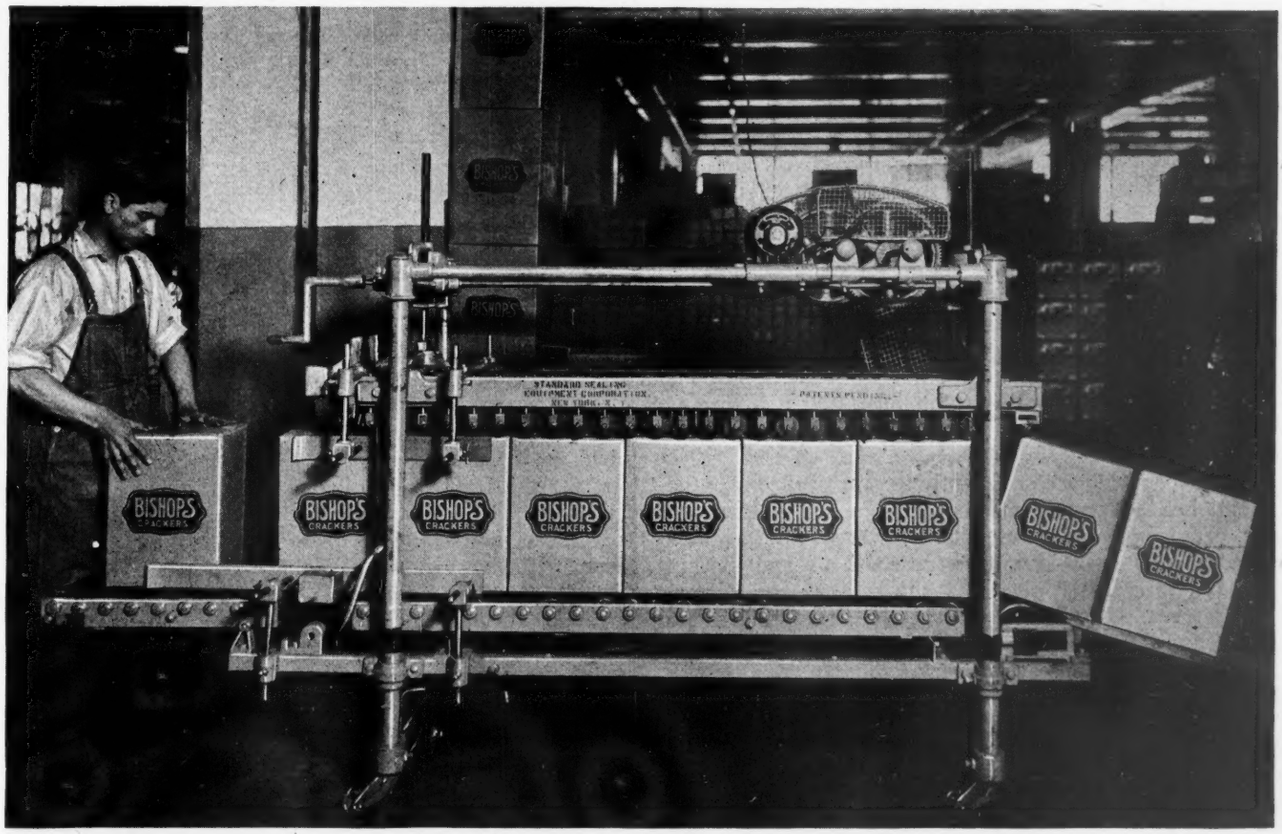
Freezing is not a method for the destruction of insects. Insect eggs which have been kept cool or frozen will commonly retain their fertility and upon being restored to proper conditions for incubation will hatch into their appropriate larvas, but the rate of incubation of the eggs is very strongly reduced as the temperature falls and at sufficiently low temperatures reaches zero. The same effect is to be noted with respect to the living larvae and beetles—that is, the activity of their vital processes is reduced and they neither feed nor reproduce but they are still there and upon being restored to normal temperatures they resume their normal activity.

2. *The Contact Method*—The second method for the control of insect infestation may be called the contact method. This depends upon bringing the insect into contact with some chemical substance which will destroy it. The contact method is very familiar in outline since it is so commonly applied, but its limitations are great. Used in confectioners' plants for the destruction of flies and similar flying pests which do not hide in unusually inaccessible places, it is probably as simple and as satisfactory a method as can be applied.

The usual procedure is to dissolve some active insecticidal material in an unobjectionable carrier, such as certain petroleum distillates which may and commonly do possess some insecticidal qualities themselves, and to apply this freely in the form of a fine mist or spray in the insect-ridden areas. Thus applied, these sprays possess no penetrating power and have no effect upon insect eggs. That is, such sprays will kill only such insects as the mist may actually come in contact with. The futility of using such an insecticide for the destruction of moths, for example, is evident since these sprays will not reach the stage of the moth's existence—that is, the larval stage—during which its real damage is done and also since the flying moth probably already has accomplished the greater part, if not all, of her mission in life, namely, the deposition of her eggs, before she is exposed to the insecticide.

It is useless and hence most uneconomical to attempt

Modern shipping cartons, such as this Robert Gair container, furnish adequate protection to farinaceous products from insect pests while the foodstuffs are in the channels of trade.



Courtesy of Kansas Agricultural Experiment Station

Generating HCN on the purifier floor of a flour mill by the pot method, in which sulphuric acid acts on sodium cyanide.

to prevent the development of roaches, ants, moths and so on by such insecticides. On the other hand, it must be conceded that if these insecticides are applied correctly and frequently enough they will result in the destruction of those insects to which easy access may be had. Hence a certain percentage, which will, however, commonly be rather small, of these insects will be prevented from doing their part toward perpetuation of their species.

For the elimination of insects which live in one place and feed in another, such as, for example, ants or roaches, it is good practice to surround their abodes with some good insecticidal powder which through ingestion, perhaps by cleaning the feet or antenna or through similar contact, will destroy those insects which pass through the powder.

3. *Fumigation*—The most effective method for the control of storage insect infestation is fumigation. Even this method is open to certain criticisms and certain criteria should be applied to the materials which are offered for use in fumigation. Fundamentally the process of fumigation consists in liberating a toxic gas in the space occupied by the insects which it is desired to destroy.

Many chemicals are sufficiently toxic to fall under the general head of fumigants, but it does not follow that they are successful fumigants. Two factors are involved: getting the fumigant into the air and getting it to the insect. If the fumigant is a gas at normal temperatures, say 60 deg. F. up, the first problem no longer exists, but many substances whose fumes are insecticidal are liquids at ordinary temperatures although they volatilize readily and their fumes easily exist in the air in gaseous form. Spontaneous evaporation, of course, will result in the transformation of the liquid into gas, but often this evaporation is too slow unless aided by extremely large evaporation surfaces or heat.

When the presence of the liquid will do no damage to the foodstuffs being fumigated, the large surface required for adequately rapid evaporation can be obtained by pouring or sprinkling or spraying the fumigant upon the foodstuffs. For example, carbon disulphide can be poured freely upon bins or cars of grain. Speeding up evaporation by heating is quite commonly employed and is not difficult, as many devices may be used for the heating. Saturated cloths hung from steam pipes, trays set on steam coils, or even kettles boiled by means of electric plates are all satisfactory solutions for this problem.

Getting the insecticidal fumigant to the insect is much more of a problem. Where the insect is in the open so far as the gas or vapor is concerned—that is, if the insect is under a shelf or behind a barrier or in a crevice of the floor, but not protected by any layer of material—this problem does not exist, for the gas or vapor has free access to all such pests. But where the insect is buried in grain or hidden in holes or shells or tightly covered with lint or dirt, it becomes necessary for the fumigant to possess certain powers of penetration.

A few fumigants possess this property to the extent which is most to be desired. Thus it has been found that for the fumigation of a bin of grain, carbon disulphide applied in sufficiently large quantities will kill not only those insects in the upper layers of the grain but those in the very bottom of the bin as well. Any one of a dozen other fumigants which might be named will have no effect beyond the first short distance in the grain. The failure of so many fumigants to penetrate properly appears to be due to their adsorption upon the grain somewhat after the manner in which the granules in the canisters used in gas masks adsorb the fumes with which they come in contact. For this reason, before a fumigant is used for the destruction of insects which are within or under any tightly or loosely packed sub-

stances, definite inquiry should be made into the degree of penetration which the fumigant under consideration possesses with respect to the covering material.

In addition to these two prime factors it is essential to keep in mind the following considerations: Is the fumigant which is being used the most effective in terms of cost per unit of volume fumigated—for example, cents per thousand cubic feet? Does its application involve training of personnel in methods of application or investment in equipment which is disproportionately high to the results it yields? Is it toxic to man and does it produce any incidental results which render it undesirable or unsatisfactory in the connection in which it is to be employed?.

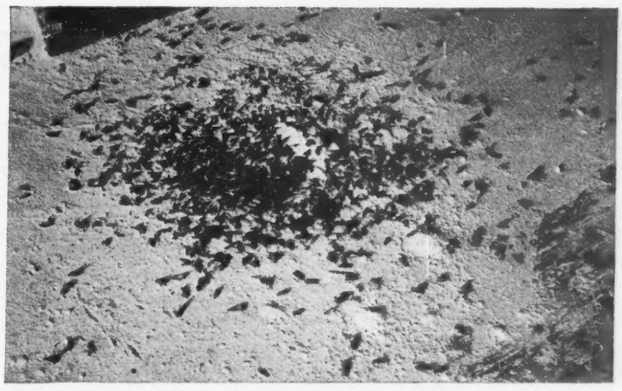
In connection with the second of these considerations, the use of hydrocyanic acid gas as a fumigant always comes first to mind. Its action is quite certain in the case of most insects although a few seem to survive

Courtesy of the Roessler & Hasslacher Chemical Co.

Fumigating with liquid HCN, mixed with a small amount of chloropicrin, absorbed in diatomaceous earth, which vaporizes spontaneously at room temperature.

treatment with it rather better than would be expected, but it is decidedly not to be trusted to untrained personnel and even in the hands of skilled operators accidents occur with regrettable frequency.

The last point made above deserves some special emphasis since serious losses have been caused manufacturers of various food products through the employment of chemicals, either as sprays or fumigants, which have left lasting traces upon the products stored in the room being treated. The use of kerosene sprays in rooms where the spray can have access to uncovered butter, bacon, lard, etc., or in general the use of fat soluble compounds in the presence of fatty substances, can be depended upon to result in imparting the odor or taste of the spray or fumigant to the fatty material. Under the head of fatty substances one may class chocolate, cocoa, cream, oleomargarin, cod liver oil, peanut butter, and so on. These will take up surprisingly quickly and retain for regrettably long periods



The harvest of death left on the floor after treatment by the method employing the diatomaceous earth carrier.

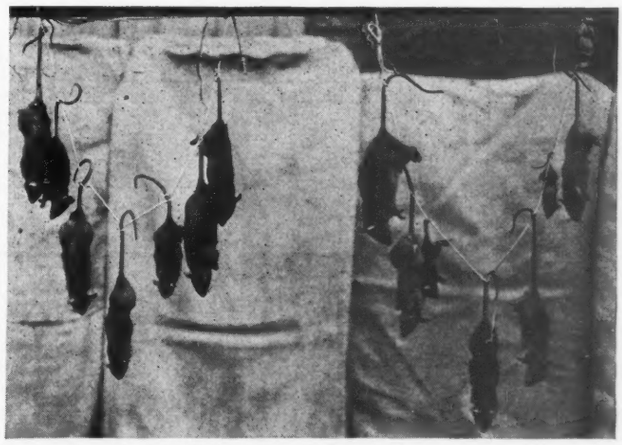
foreign odors due to such oil soluble substances as ethylene dichloride, kerosene, carbon tetrachloride, paradichlorobenzene, naphthalene and so on.

In passing, it should be noted that some of these fumigants, such as hydrocyanic acid gas and sulphur dioxide, damage and discolor many kinds of equipment.

It should always be borne in mind that no insecticide will control or kill insects which are beyond its reach. Fumigation or treatment of one room to which free access may be had by insects from other parts of the plant is doomed to failure because, although the infestation actually existing and present in the room at the time of treatment may have been completely eradicated, re-infestation soon will follow. If any given area can be properly and adequately freed from insects and sealed so tightly that no new infestation can occur, such a room becomes a fairly safe storage place for a period, but even so, re-infestation can almost invariably be counted upon through the introduction of insects in most common raw materials.

It is safe to say, therefore, that the permanent solution of the problem of insect infestation can never be obtained so long as insects exist on the earth. Eternal vigilance will remain the price of comparative peace here as truly as in universal affairs. The only security which can be obtained is that of an armed truce in which the repetition of treatment with effective weapons is employed regularly upon the revival of the defeated party to the armistice in the battle between the invading insects and man.

Insects are not the only casualties in a campaign of plant fumigation.



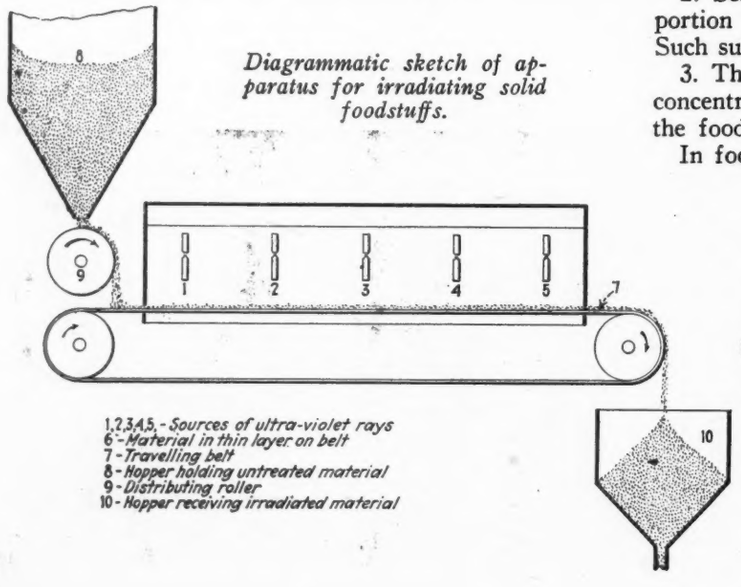
Ultra-Violet Irradiation of Food On a Tonnage Basis

By M. J. Dorcas
National Carbon Company, Inc., Cleveland, Ohio

THE MAJORITY of food manufacturers know that the value of many foods from a nutritional standpoint can be increased by exposing these foods to ultra-violet rays. It is known equally well that the increase of the value of the food, whether for human or animal consumption, is the result of increased vitamin D content—the vitamin necessary for normal growth. The most noticeable—but not the only—effect of lack of vitamin D in a food is the faulty development of the bones of growing animals that are fed exclusively upon it. It is a fact, not well recognized, that the process of ultra-violet treatment is capable of application to food products, either solid or liquid, on a large scale by a continuous process, the cost of which may be expressed by cents, rather than dollars, per ton of food treated.

Most of the reports found in the scientific literature describing the irradiation of food products have described the laboratory technique used. This has frequently been somewhat as follows: "A few ounces of the food material were spread out in a layer, perhaps one-eighth of an inch thick, and exposed to a source of ultra-violet radiation for intervals varying from thirty minutes to twelve hours, and were found to have increased their content of vitamin D." If the radiation was continued for several days the food sometimes lost what antirachitic property it may have possessed originally.

These scientific experiments are of extreme importance and will always be considered as some of the great classic experiments of the science of nutrition. Some manufacturers who have considered the experiments alone have, however, acquired the idea that the process would be very expensive in time and money, and might be entirely unsuitable for food materials handled on a tonnage basis. The five years of research and development work following the first discoveries have resulted in the possibility of a different technique that now makes the process of irradiation of food material a practicable one for consideration whenever the antirachitic property of a substance is to be or can be considered.



Diagrammatic sketch of apparatus for irradiating solid foodstuffs.

That the quantity of ultra-violet radiation necessary to cause the desired activation is very small is an established fact. It has also been shown that the change from the inactive sterol to the vitamin D is a true photochemical reaction. This means that, if the material is exposed to an increasingly powerful source of ultra-violet radiation, the change will proceed more rapidly. Manufacturers of apparatus for the production of ultra-violet radiation have increased the power of these sources. It now is possible to design equipment for the treatment of food with ultra-violet rays of such size that each unit will treat several hundred pounds per minute or many tons per hour.

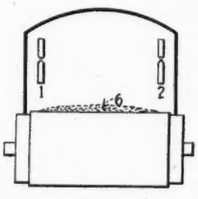
Of all the vitamins the antirachitic vitamin is the most likely to be deficient in common diets. If it is, therefore, desirable to be able to increase the nutritional value of a substantial part of all foods by the addition of vitamin D, the addition may be made by one or more of at least three methods:

1. The food may be exposed to a source of ultra-violet radiation of the proper quality. These sources are usually the carbon arc, the quartz mercury arc, or the summer sunshine.

2. Some natural substance that contains a high proportion of the vitamin may be mixed with the food. Such substances are the cod-liver or other fish-liver oils.

3. The vitamin may be synthesized in a pure or highly concentrated form and then diluted and mixed with the food.

In food for human consumption, palatability is of the greatest importance, and for this reason it probably will be found preferable to irradiate such food to enhance the vitamin D content rather than to supply it by the addition of cod-liver oil, which frequently has a distinct taste. The process of applying ultra-violet radiation to foodstuffs will vary in minor details with each material. When irradiating solid materials the light is effective only on the surface of



the particles, and the concentration of activatable material in this surface will be different with different materials. In the treatment of liquids, milk for example, the liquid is opaque to the ultra-violet, and the activation takes place only on the surface.

Liquids can be irradiated in either of two ways: A deep vat of liquid can be placed under a light source, while agitating it to bring fresh material to the surface, until the batch has acquired the required antirachitic potency. The irradiation can also be done in a continuous process by spreading out the liquid in a thin film and letting it fall around or in front of an ultra-violet generator. If the generator is a weak source of ultra-violet rays, the film will have to fall past several such sources in succession. If the source is one of the largest carbon arcs, the required activity can be developed in an exposure of one second while the film flows past a single unit.

In the treatment of solid foodstuffs only the continuous process is suitable. Mechanical difficulties make it impracticable to agitate a bin of meal or flour. The solid foodstuffs can readily be activated by spreading the material in a thin layer on a belt and letting it fall once or twice to lower belts to secure partial turning over of the particles. While the material travels on the belt, or during its falls, it can be exposed to the ultra-violet irradiation.

In spite of the variation of individual materials, the predicted time of necessary exposure will probably vary from fifteen minutes if the source is bright sunshine, down to one second, if the source is the largest carbon arc. Such powerful sources of radiation are, of course, large units and are not to be confused with the small units frequently used by physicians for the treatment of individual patients.

The important consequence of the development of the irradiation process is that it makes it possible to increase the antirachitic value of many foods without altering their appearance or taste and to do it at a cost so low that it will not be necessary to change the retail price of the food.

Eliminating Static From Rubber or Leather Belts

INVESTIGATIONS of the U. S. Bureau of Chemistry and Soils on belt dressing for the elimination of static have recently been summarized by P. W. Edwards and J. O. Read, of the chemical engineering division of the Bureau. This work indicates important points which may be utilized in safeguarding gassy atmospheres against explosion hazard which is sometimes caused by sparks from static electricity.

Static electricity charges, a frequent source of ignition for gas and dust explosions, are generated on power transmission belts by friction of the belt on the pulley, by the separation of the belt from the pulley, and to a less extent by the friction of the atmosphere on the belt. On conveyor belts they are generated in the same way and, in addition, by the friction of the conveyed material on the belt. On machinery, static charges can be accounted for by one or more of the following: (1) induction, (2) transmission from other sources, (3) by the friction caused by the material passing through the machine.

The static electricity can be removed from belts and other surfaces by grounding systems, humidifying the air sufficiently, ionizing the air in contact with the belt or other surface by means of a gas flame or by the silent discharge of high-frequency and high-voltage current. Static electricity can be eliminated also by special belt dressings, the requirements for which are: (1) They must have sufficient electrical conductivity to remove or neutralize static electrical charges as rapidly as they are formed; (2) they should be of such a nature that they can be easily applied; (3) they should resist wear; (4) they should not decrease the coefficient of friction of the belt on the pulley, and (5) they should not be injurious to the belt.

A good *rubber-belt* dressing can be prepared by mixing 18 parts of lamp black with 82 parts of good spar varnish. A smaller quantity of lamp black may prevent most of the cracking which develops after the dressing is used for several months. The dressing must dry on the belt before running. A non-flammable thinner for the varnish can be prepared by mixing equal volumes of carbon tetrachloride and "varnish-makers and painters" naphtha.

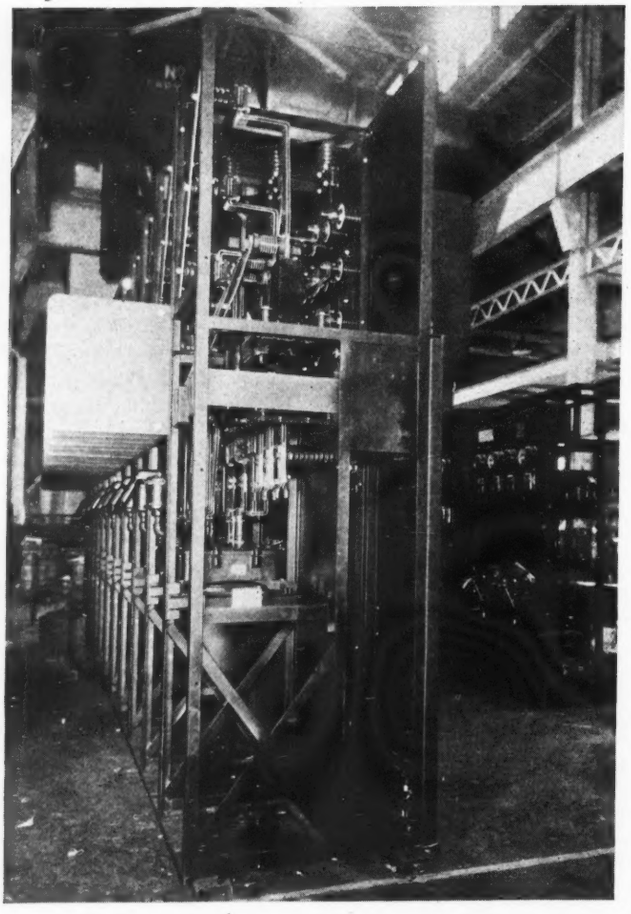
A non-static *leather-belt* dressing which has considerable merit consists of 100 cc. liquid fish glue, 80 cc. glycerine, 100 cc. sulphonated castor oil, 170 cc. water, 82 grams lamp black, and 20 cc. of 2 per cent ammonium hydroxide. These proportions may not be the best for all conditions; in some cases better results probably will be obtained by increasing the quantities of fish glue and glycerine. This dressing may be easily applied with a brush while the belt is moving. It is not necessary for the dressing to dry before running the belt.

It is a well known fact that belts should be treated periodically with water and suitable oils if they are expected to give their best service. If they are not maintained in this manner they become dry and hard and deteriorate rapidly. When the belt dressing is applied to a belt that has not been properly maintained, the belt absorbs the oils and glycerine, and as a result the surface of the belt loses its "tackiness" about one week after the dressing has been applied. This condition may be remedied by making another application of the dressing and continuing to do this until the belt has absorbed enough oil, glycerine, and water to make it flexible. This treatment will cause the belt to stretch to some extent. When the dressing is applied to a belt that has been properly maintained by the application of oil and some water, there should be very little additional stretch when the belt dressing is applied.

Fruit Dehydrating Plant for Philippines

The first fruit dehydrating plant to be built in the Philippines is now being erected in Manila by a local food products company, according to a report to the Department of Commerce from Trade Commissioner G. C. Howard, Manila. The plant is to have a daily rated capacity of one ton of dried fruit for the purpose of drying and sterilizing tropical fruits for export to the confectionery trade in the United States as well as to furnish the local candy and ice cream trade.

Modern SWITCHGEAR *for Modern Industries*



End view of switchboard assembly showing welded steel framework, oil circuit breakers, disconnecting switches, buses, and connections.

By A. J. A. PETERSON
Switchboard Engineer,
Westinghouse Electric & Manufacturing Company

SWITCHGEAR is the means for controlling the electrical energy, either in generation, conversion, or distribution. As such, it has quite frequently been regarded as a necessary evil, resulting from what some people call the intractable nature of electricity, and little credit has been given for its contribution to the electrical industry. With a reasonable emphasis on its true purpose—that is, control and distribution—it appears to be less of a necessary evil and more of a distinct advantage. When the food industry was young, many food products were sold in bulk and distributed to the retailer in whatever type of package was locally convenient. Remembering the cracker barrel, the molasses barrel, the oatmeal barrel, we also picture paper bags, tin pails, and other familiar paraphernalia. Improvement in quality has come with the advent of factory packaging. The early forms of switchgear for electrical control and distribution undoubtedly were crude, also, as viewed from present-day standards.

The various containers and packages in which food products are sold today are not regarded as undesirable necessities, but are actually looked upon as essential aids to handling, marketing and sales. In the same way, properly chosen switchgear contributes to the control and distribution of electricity by giving economical operation, safety of operation and reduction of shutdown.

The fundamentals of any switchgear or switchboard apparatus are safety, simplicity, flexibility, reliability and good appearance. In accomplishing its purposes these features are of equal value. The apparatus must be suitable for its requirements without being too elaborate. It must be easy to install and easy to operate. It must stay in service for long periods without unusual attention and with little maintenance. It must be suitable for whatever switching requirements or maintenance problems may develop. Its appearance must be such as to show its high quality and thus command the respect it warrants. Above all, it must be safe for the personnel who must handle, control and maintain it.

Probably the most remarkable of the modern switchgear innovations is the adoption of the steel switchboard panel instead of the former panel of insulated material, such as slate or marble. This also has been the forerunner of other equally remarkable changes in previously accepted switchgear practice. The steel panel is suitable for either main power control or low-voltage feeder distribution.

The panel itself consists of a single sheet of $\frac{1}{8}$-in. cold-rolled "stretcher-leveled" steel, specially treated to remove all tendency to bulge or warp. This material is the same as that used in modern high-grade metal furniture, having a very smooth, flat surface. The vertical edges are bent back to form 3-in. deep channel sides and the top and bottom are similarly bent to form an angle. All front edges are bent on a small radius, in order to provide the best possible appearance. Corners where the bent-back sides meet are welded to increase the rigidity, and ground smooth to insure a good appearance.

This type of construction gives very great strength and stiffness, and eliminates all mounting frames, such as the pipe uprights and angles that were used with slate and marble switchboards. The vertical channel sections serve not only to support the panel and tie to adjacent panels but also to support such accessories as must be

mounted on the rear of the panel. They also serve as raceways for vertical wiring, thus eliminating much of the ordinary small wiring which is seen on the back of the conventional switchboard panel. The angles at the top and bottom provide ready means for bolting to top plates and bottom sills. The steel panels are manufactured in conventional sizes, and are finished in a velvety dull black lacquer of great durability.

Improved appearance, permanence of finish, durability, absence of fracture and chipping are advantages characteristic of steel panels. But of major importance is the fact that the use of steel panels reduces the installed cost. This results primarily from the reduction in weight, a slate panel with angle framework weighing approximately 600 lb. while the equivalent steel panel weighs only 100 lb.

The lower weight reduces freight and cartage charges. The increased strength and reduced weight permit the complete assembly of all instruments, relays and similar apparatus on the panel. This equipment formerly was shipped separately, and the elimination of such separate shipment further reduces the transportation and handling costs. Furthermore, the erection force handles only one crate containing a completely equipped panel instead of one main crate and many smaller crates. This further reduces the handling cost as well as the expense formerly incurred in mounting the instruments on the panel and subsequently connecting them up to the wiring on the switchboard.

Simple Construction Minimizes Trouble

Single-piece construction of the panel permits the alignment of several sections or panels into one switchboard, without the usual difficulties met with in the multi-section panel of slate or marble. Improved methods of wiring, which utilize the channel sides of the panel as raceways or wiring troughs, together with the completeness of connections to instruments and terminal blocks made possible by the complete assembly, eliminate all connection work on the panel during the erection and facilitate further inspection and even subsequent alteration.

With the switchboard equipment completely installed on the panel, the manufacturer makes complete performance tests, proving the correctness of the wiring, connections of polyphase and directional instruments, and so on. In addition, the complete panel can be effectively grounded and a high voltage test (usually 1,200 to 1,500 volts) is made between the wiring and the panels. This assures against breakdown within the instruments, switches and wiring to ground. It immediately exposes any defects which might have resulted from the actual work of assembly and wiring. The expense of this testing and correcting formerly was borne by the purchaser and charged to construction, but is now eliminated.

The idea of a steel panel for mounting the low-voltage knife switches usually is quite startling when one is accustomed to thinking of these knife switches assembled on an insulating base such as slate or marble. Since the steel switchboard panel has many advantages of its own, suitable mechanism and mounting for the conventional knife switch has been developed in order to permit of the assembly of the knife switches on the back of the steel panel. This results in the complete removal of all live parts from the front of the board, so that there is no danger of injury to the operator as a result of accidental contact.

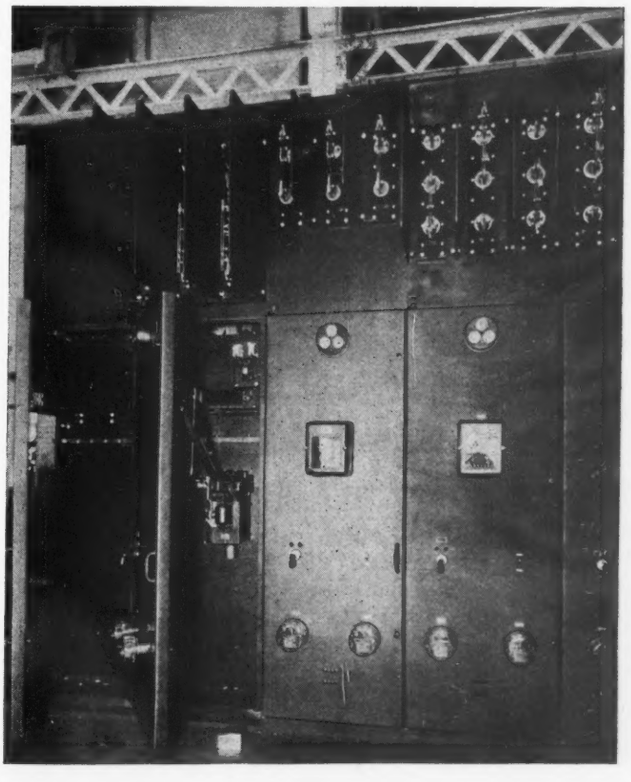
The handle for the switch projects through the front of the steel panel, giving the same ease of operation as with the older form of switch. Fuses are accessible for replacement through a suitably hinged cover, which can be opened only when the switch is in the open position. The ordinary low-voltage distribution board consists of several such knife switch units assembled as shown in the illustration below.

When air or carbon circuit breakers are used, similar mounting and operating means are provided so that all live parts are located in back of the steel panel, giving similar protection against accidental contact. All connections between switches, fuses and busbars, are, of course, located in the rear of the switchboard panel, contributing to the same general features of safety.

For use with switching equipment involving oil circuit breakers and other apparatus which should not and cannot be mounted within reach of the operator, the steel panel is best suited, serving not only as a base for mounting the equipment but also as the safest means of isolation. The circuit breakers are mounted behind the panel, or at a distance, and in either case are operated either by mechanical levers or by electric means. Instruments and other similar devices are provided with insulated studs, so that they are easily mounted on steel panels without any change. Instrument switches, control switches for electrically operated circuit breakers and similar devices are provided in suitable housings to be mounted on the rear of the panel, lending themselves very satisfactorily to steel-panel mounting.

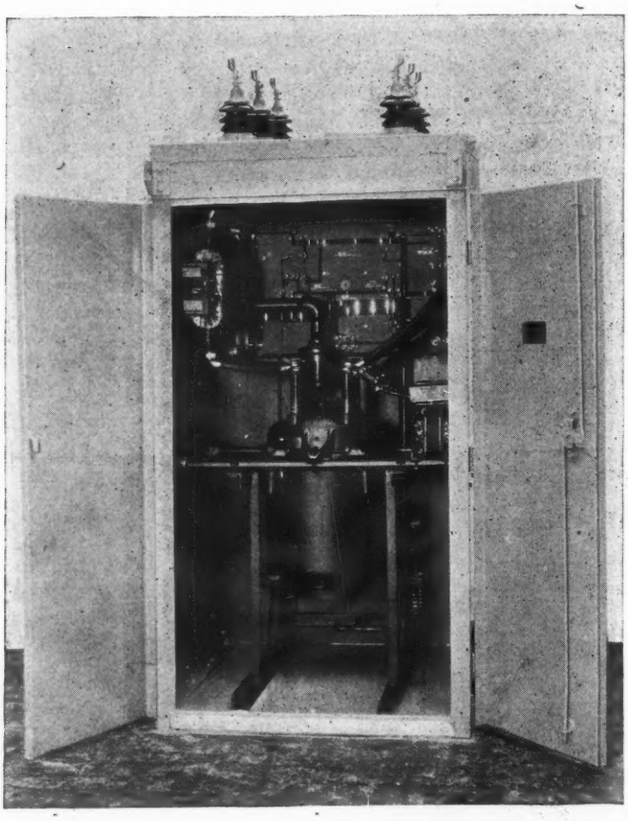
For a.-c. distribution, requiring oil circuit breakers, there has been developed a self-contained unit consisting of the oil circuit breaker with its operating mechanism, disconnecting switches, instrument transformers, and the control panel, all suitably mounted on a welded structural steel framework. The usual complement of meters and

Front view of assembled switchboard with two panels open to expose mechanism and wiring.



instruments, relays and control switches is mounted on a conventional steel panel. This panel is hinged on the front members of the frame so that it can be opened out to give access to the wiring on the rear of the panel and to the circuit-breaker mechanism within. A sheet-steel barrier separates the circuit-breaker mechanism from the breaker itself, together with the instrument transformers and main connections, thereby permitting the operator to inspect or adjust the mechanism without danger of accidental contact with the high-voltage equipment.

The small wiring is mounted on the back of the swinging steel panel in the usual form. This wiring is terminated on its own connection blocks, from which it is connected by flexible leads to terminal blocks on the rigid framework. From this point it connects to the instrument transformers, circuit-breaker controls, and the like. Thus it is seen that this arrangement permits of complete inspection of the rear of the panel and the mechanism, including all wiring, and permits testing of the various instruments and devices, without danger to the operator or interruption to service.



Oil circuit breakers, central panel and other equipment housed for outdoor service, if desired.

This unit is completely self-contained, so that it can be ordered from the manufacturer as a unit, without the difficulties attendant on the previous practice of ordering an assortment of miscellaneous parts. As such, it is completely assembled by the manufacturer, with personnel and tools particularly trained and suited for the purpose. All detail work of assembly and interconnection and all testing work are done in the factory, so that, to paraphrase certain well-known products, the user needs only "add hot water and serve"—"hot water" in this case being the "juice"—or connections to the line and load. Being self-supporting, the user provides no special mounting or elaborate building construction, but provides merely a flat open space. Each unit can be individually inclosed with steel, or an assembly of several units can be similarly inclosed with grille work or other material, so as to avoid access by unauthorized persons.

Being a complete unit by itself, it is readily transported, installed and placed in service. Furthermore, several units may be assembled in a row so as to form the conventional switchboard. It requires no skilled labor for its erection, but can nearly always be handled by the user's own electrical personnel.

For larger installations, involving oil circuit breakers, for use primarily as power supplies or for controlling large motors, various other forms of steel-mounted and steel-inclosed equipment have been developed. The simplest is a compartment with the oil circuit breaker fixed in position, busbars, disconnecting switches and other accessories located as is most convenient for the assembly. The whole equipment is completely inclosed so as to confine all disturbances and eliminate danger to the operator. Another form involves quick removable oil circuit breakers, for inspection and maintenance purposes. These oil circuit breakers are so installed as to permit them to be removed either horizontally or vertically.

Some of these horizontal draw-out circuit-breaker units, frequently called trucks, have their full complement of instruments, relays and control switches mounted directly on the front. This completely unifies all equipment on one circuit, and eliminates the expense of a separate switchboard and control wire interconnections.

Other forms of this equipment are so-called "switch houses" which provide a comparatively small steel housing with suitable entrance bushings, the housing inclosing the oil circuit breakers, control panel and other equipment, the complete assembly being entirely suitable for outdoor service. These switch houses are commonly used at the entrance of the power company's lines to an industrial plant.

Insures Greater Safety to Personnel

The present tendency in switchgear is the development of apparatus which is primarily *better* and secondarily *cheaper*. The equipment is better in that it provides for its design, construction and testing by factory experts. It is better because it does electrical work in an electrical factory, instead of leaving this to be done in some industrial plant. It is better in that it provides far greater safety to the operating personnel than was possible before. It is better because it presents the most attractive form of switchgear that has yet been developed, something good to look at and worth showing off to the owners, board of directors, and visitors. It is cheaper in the ultimate because the user eliminates a great deal of the erection work that was formerly done by unskilled and therefore expensive personnel. It simplifies the building construction and reduces the time required for installation.

By being better constructed than earlier switchgear it reduces time for maintenance and outages. By being safer for the operating force it reduces the insurance cost or the losses due to accident. Since the user of this switchgear is interested primarily in the production of some other commodity, making all these better things cheaper is all the better.

Preparing a tank of cucumbers in a Heinz pickle station for the important lactic-acid fermentation

Action of BACTERIA *Essential* In Production of Many Foods

By Henry Field Smyth
AND
Miriam Stewart Iszard
School of Hygiene
University of Pennsylvania

FOR centuries such foods as sauerkraut, pickles, green olives and cheeses have been known to depend on bacterial, yeast or mold action for their curing and preservation. Only recently, however, have men begun to study scientifically these reactions and to appreciate how and why these micro-organisms act. It is the intent here to consider certain specific biologic food processes, and to show the need of a bacteriologist-chemist in such food industries.

In this age of lactic-acid therapy such foods as sauerkraut and fermented milks are coming to the foreground. How familiar to hear someone say "start the day right with glass of sauerkraut juice," or "drink buttermilk, for there you find that germ of perpetual youth," or "would you add ten years to your life? If so, drink acidophilus milk, which holds the culture of health."

Sauerkraut—This is prepared by a bacterial process due to a group of lactic-acid producing organisms, which act to change raw cabbage to the well-known product sauerkraut. These *Lactobacilli* are inherent in the raw cabbage, having probably gained access thereto from the soil. The process consists of coring and finely shredding the cabbage, which is placed in large wooden vats. These commercial vats or tanks range in size up to 50 tons capacity. Salt (approximating 2½ per cent by weight) is sprinkled over the cabbage and thoroughly mixed. The vat is covered with a weighted lid, juice is withdrawn from the cabbage by the osmotic action of the salt and the bacterial fermentation takes place in the liquid. The length of the fermentation period, depending upon the initial number of *Lactobacilli* present in the cabbage, temperature, acidity and oxygen content, can be controlled at will by the bio-chemist. During this fermentation stage, the lactic-acid producing organisms acting upon the sugars and mannite in the cabbage, form lactic acid along with lesser amounts of ethyl alcohol, acetic acid, reducing sugars, carbon dioxide and other intermediary fermentation compounds, all of which give to the finished product the characteristic "kraut" flavor. When this period is completed the product has a pH of

about 3.7, and the total acidity, expressed as lactic acid, may be as high as 1.8 per cent.

After fermentation, the kraut is placed in barrels and tightly sealed to prevent microbial contamination, or it is canned. If canned, it is heated and while hot is placed in cans, sealed, and heated again to over 225 deg. for one hour. This gives a sterile product. As a rule a canned product is allowed to age or ferment for a shorter period

(Courtesy Kraft-Phenix Cheese Corporation)

Large, well-equipped laboratory devoted exclusively to cheese research

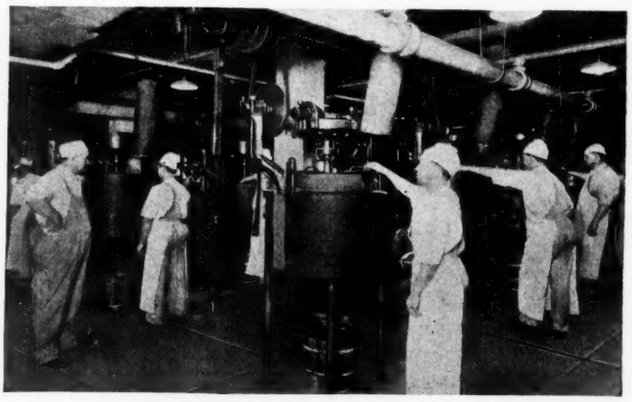
of time than that sold in bulk. Hence it has a lighter color and lower acidity than a product sold in bulk.

Sauerkraut making is a simple process, adaptable both to small- and large-scale production. Points to be borne in mind by the producer are: (1) Sound heads should be selected; soft heads imply decomposition and if used will introduce into the product organisms which may produce deleterious changes and flavors. (2) Cabbages should be thoroughly washed to remove soil organisms which produce undesirable chemical changes. (3) The cabbage should be finely shredded to permit more readily the bacterial penetration within the tissues. Some producers assert that a better fermentation occurs if part of the core is left. This probably is attributable to the presence of a greater number of *Lactobacilli* in the core. (4) The question of bacterial species is important. The brine formed by the salt holds in check the undesirable forms but permits of the development of the *Lactobacilli.* Experiments recently reported from the Wisconsin Agricultural Experiment Station state that in sauerkraut fermentation, "the fermentation of the cabbage is carried on by a sequence of flora, consisting of at least two distinctly different types of lactic-acid-producing bacteria." *Lactobacillus pentosus* (2 strains), *Lactobacillus arabinosus* and *Lactobacillus pentoaceticus* have been isolated by Fred, Peterson and Anderson from sauerkraut, and named by them. To obtain a desirable bacterial flora for the fermentation of the cabbage it has been suggested that the raw cabbage be inoculated with a "starter" containing the desired *Lactobacilli.* (5) Since there is a direct relationship between temperature of fermentation, acidity of product, fermentation rate, and the quality of the product, as was ably shown in experiments done at the Wisconsin Agricultural Station, the producer should so control these factors as to produce a product of optimum quality.

Pickles and Olives—Cucumbers, the raw vegetable from which pickles are prepared, are roughly assorted into three sizes and then immediately placed in vats containing a brine solution where they undergo fermentation. During this fermentation process, which is brought about by lactic-acid bacteria, the cucumbers are kept immersed in a brine solution approximating between 8 and 10 per cent. The fermentation period ranges between four and six weeks. After the fermentation the treatment of the cucumber depends on the type of pickle desired, varying as regards the addition of sugar, spices, dill, vinegar, etc. In the pickle making the question of brine percentage, the addition of sugar to aid in fermentation, and temperature should be controlled. Too weak a brine solution admits of the action of deleterious bacteria and yeast, while too strong a brine arrests the action of the desired lactic-acid forms. The concentration of the brine also affects the rate of "cure," the curing being more rapid in weaker brines and slower in greater concentrations. The length of time in which brine pickles may be expected to remain in crisp, firm condition is dependent to a considerable degree upon the conditions surrounding their fermentation and curing. Pickles which are slow cured thus seem to have a longer period of merchantable life, but this "longevity" is gained at the expense of salt, greatly increased time and a reduced content of acidity due to the slower fermentation. According to Lefevre, sugar may be added to stimulate fermentation by the desirable forms of bacteria.

The olive depends upon the *Lactobacilli* for its preparation for edible purposes. A paper read by one of us before the College of Physicians of Philadelphia and published in the *Transaction of the College of Physicians,* Vol. XLV, 1923, states that "Green-olive curing or pickling is an old-established industry, peculiar to Andalusia in Spain, with many traditions and fixed ideas. I have met one man who has been curing olives for forty years and another middle-aged man curing from trees planted by his grandfather. Spain has almost four million acres in olive groves, but 97 per cent of the fruit is grown for oil. The curing of green olives is carried on only around Seville, and that mostly for the American trade.

"Olives picked green in September and October are gathered by hand and carried in donkey panniers direct to the curing plant, where as soon as possible they are placed in cement vats and covered with a weak caustic alkali. Soaking for four to eight hours softens the skin and removes the naturally bitter taste of the fresh fruit.



Blending and pasteurizing room in a Kraft-Phenix loaf cheese plant

When the caustic has penetrated one-quarter to one-half of the distance to the stone it is run off, the fruit washed in two or more changes of water, and then placed in a 10 per cent brine solution made from sea salt and headed up in the large casks. These are rolled into the sun and left with open bungs. They undergo a prolonged, natural, gassy fermentation, which mellows the fruit and develops the desired flavor and olive-green color.

Froth and surface scum are flushed off daily with fresh brine.

"At the end of fermentation the fruit is sorted to size and stuffed or directly repacked in fresh brine in which it is held until it is repacked in glass in this country. The keeping quality of such fruit depends on the exclusion of air, the salt content of the brine and the acidity developed by fermentation, and spoilage is due to defects in one or more of these factors. The combination of salt and acid inhibits growth and toxin formation of such organisms as *B. botulinus,* and, as far as I was able to learn from Spanish physicians and bacteriologists, botulism and botulinus bacilli are unknown in the Seville area. Although pickled olives cannot be satisfactorily sterilized, yet careful sorting when picking and after fermentation, and again before packing in jars, should insure that none but firm, sound, healthy fruit will reach the consumer—kept sound by air exclusion, salt and acid. Properly cured and packed, green fruit keeps indefinitely, and I have examined a jar packed in 1898 still in good condition."

Fermented Milks—Long before the days of bacterial knowledge of fermented milks, sour milks constituted an important diet of the Aryan and Slavic worlds, each country giving its own name to its product, as *Yoghourt* in Bulgaria and Turkey, *Matzoon* in Armenia, *Lebben* in Egypt, *Kumiss* along the River Kuma, and *Kefir* from the Caucasus Mountains of Russia. Today we know that the distinctive flavors in the above milks are due to the action of *Streptococci* of the lactic-acid forming type, *Lactobacilli* and yeasts. The chemical composition of the milk, the temperature at which the product is held, humidity and strains of organisms produce the variation in flavors. Formerly these milks were prepared by keeping on hand some of the fermented milk and "seeding" the fresh batch with it. Today this process is no hit-or-miss undertaking.

Here in the United States buttermilk is prepared by most of our large dairies in modern equipped plants. The milk is brought to the plant, and if skim buttermilk is desired the cream is separated; if cream buttermilk is desired sufficient cream is added to give the desired fat content. The milk is pasteurized at 145 deg. F. for one-half hour. This rids the product of any harmful bacterial forms. The pasteurized milk is placed in glass-lined tanks, and to it is added a "starter" or culture of desired *Lactobacilli.* These "starters" can be purchased from biological laboratories specializing in their preparation. Such "starters" may contain a mixture of *Lactobacilli* and *Streptococcus lactis.*

In the tanks the product undergoes a lactic-acid fermentation for a definite period of time (about 18 hours), and at a definite temperature (approximating 70 deg. F.). Agitation during the fermentation helps to gain a homogeneous product. Since quality of flavor depends upon the purity and *viability* of the organisms present in the "starter," and upon suitable temperature and humidity, this process should be carefully controlled by a research laboratory. There should be routine rigid microscopic examination of the "starter" culture because the presence of deleterious forms (such as Oidium) ruins the flavor. Temperature and humidity charts likewise should be kept. Such care results in a uniform dairy product.

Acidophilus milk, recently put on the market, is intended primarily for individuals who are suffering from intestinal disturbances. This product is produced by a lactic-acid fermentation of milk brought about by *Lactobacillus acidophilus.* Many of the larger dairies are selling this product, but its preparation is conducted in a specially equipped plant. The delicate nature of the culture makes it difficult to produce acidophilus milk. The value of this milk over buttermilk lies in the fact that the acidophilus bacillus is a normal inhabitant of the intestinal tract and when ingested with this milk is able to be established there. Because of its ability to form lactic acid it reduces the alkalinity of the intestinal tract so that the putrefactive and harmful bacteria causing intestinal disturbances are supplanted by this new desirable species.

Casks of olives curing in the sun; the mounds of foam over the bungholes are flushed off every day with fresh brine

Butter—The day of the family butter churn has passed. No longer does the cream sit around awaiting "ripening" to occur. Today in up-to-date built creameries the sweet cream arrives in glass-lined trucks, is pasteurized to get rid of bacteria, and "ripened" by inoculating with a "butter starter." This "starter" is a mixture of several lactic-acid producing bacteria which cause souring of the cream, and in addition produce small amounts of acetic acid and other volatile compounds. From this combined, or symbiotic, action of the flora the butter receives the aroma.

If the butter is sold as sweet butter no salt is added, but if sold as salted butter, sufficient sodium chloride is added to arrest further bacterial development. Purity of starter culture, temperature control, initial quality of the creams, and cleanliness mean much toward producing a butter uniform in composition, texture and flavor, and can be controlled and checked by the laboratory. Bulletin 443 from the University of California shows what standardization means in producing a butter uniform in quality.

Cheeses—Anyone interested in the varieties of cheeses, descriptions of preparations, and analyses is referred to Bulletin No. 608 of U. S. Department of Agriculture. Here about a hundred and thirty different cheeses are listed and described. Cheeses are divided into two groups, soft and hard cheeses, which separation is based on water content. Within each group the variety in flavor and consistency depends upon the chemical composition of the milk and special technique in controlling temperature, humidity, acidity, and bacterial flora which enter into lactic-acid production and the "ripening" process. The wise producer keeps a rigid check on his "starter" culture. If his culture "goes sick" or loses its ability to produce the changes desired, or if he permits any contaminating species to get into the "starter," the end product is altered as to flavor and quality. The

question of "starter" cultures has been very carefully studied.

Cheese manufacture depends for lactic-acid fermentation upon a large group of organisms which are *Streptococcus lactis* strains and *Lactobacilli.* Individual members of these groups have the power of producing varying amounts of volatile acids and other decomposition products which, though present in minute amounts, affect the flavor and odor of the product. This is particularly noticeable in rennet curd or hard cheeses. The question of bacteria concerned in Cheddar cheese flavor has been studied at the U. S. Department of Agriculture and Wisconsin Agricultural Experiment Station. In some cheeses these final flavor products are due to other groups of bacteria, such as the propionic group in Swiss cheese, and molds in Roquefort and Camembert cheeses.

Alcoholic and Acetic Acid Fermentation

Beverages—In the preparation of beverages containing small amounts of alcohol, such as root beer from roots, cider from apples, and cereal beverages from grains, the principle involved is the fermentation of sugars into alcohol by means of yeast (principally of the genus *Saccharomyces*). Along with the alcohol are formed lesser amounts of glycerine, organic acid esters, such as succinic, lactic and acetic, all of which give to the product the characteristic flavor. By a careful selection of strains of cultivated yeast the flavor of the final product is controlled. Here in the United States there has arisen recently an increased demand for beverages which will meet with the legal requirements of the country. In the case of cider fermentation the manufacturer has been required to arrest the fermentation by means of chemicals or pasteurization, both of which methods sometimes give to the product an undesirable flavor. Recently a new method for clear cider preparation meeting the alcoholic requirements and possessing natural flavor has been worked out by the Washington Agricultural Experiment Station.

Vinegar—The making of vinegar is a two-phase biologic process, the first step being an alcoholic fermentation brought about by a yeast (genus *Saccharomyces*) and the subsequent step a bacterial fermentation, during which step the *Acetobacters* act upon the alcohol and produce acetic acid. Several processes have been devised for vinegar manufacture, but in each case, since micro-organisms are involved, the question of purity of "starter" and temperature control enters, and the laboratory man can do his part in producing a uniform product.

Thus we see that bacteria and other forms of microscopic life act on food substances to prepare them for consumption or to preserve them in various ways. They may change their consistency, may alter flavor by removing objectionable taste or by adding new flavor or bouquet, or they may produce acid end products both affecting flavor and aiding in preservation.

In food industries depending upon such biological reactions, vast quantities of materials have spoiled because of irregularities not understood by the producer. When such spoilage has been marked it has resulted in considerable financial loss. In less obvious instances, where spoilage has passed unnoticed or been disregarded by the vendor or consumer, quality has been lowered and the chemical nature of the product so altered as to have been the cause of cases of unexplained illness.

Today larger and more progressive producers recognize these facts and look to science and to scientific workers to help solve their problems. As yet, however, what are primarily biologic problems are often given to a chemist with no special biological training. Sooner or later he finds that he must call a bacteriologist to his aid. In many ways the chemist and the biologist are coming into closer relation to each other. The industrial and food bacteriologist of today realizes his absolute need of a chemical viewpoint, and the chemist realizes that his training is incomplete without some knowledge of bacterial processes.

Bacterial processes in the food industries, as well as in the newer non-food industrial fermentations, differ materially from those usually studied by the medical bacteriologist and require different methods of study. The medical bacteriologist grows his cultures and studies these reactions and products in test tubes or 50- to 100-c.c. flasks; the food and industrial bacteriologist begins with batches of a liter or more and at times uses test batches measured in tons. Interesting experiments recently reported from the Wisconsin Agricultural Experiment Station on sauerkraut fermentations were conducted in vats of 8 tons capacity. To maintain uniform temperature in batches of such volume, stirring ought to be used or otherwise mixed variable results will be obtained in different portions of the batch. Where liquids only are being acted upon, as in the milk products industries, stirring can easily be done, but in the curing of pickles and olives, it is a difficult task, and in the sauerkraut fermentation it is quite out of the question.

(Courtesy National Kraut Packers' Assn.)

Sauerkraut fermentation vats

The medical bacteriologist, as a rule, works with pure cultures of definite strains of one type of organism or with known strains of related organisms. The presence of even a few organisms of another type completely ruins his experiment or renders unfit for use a vaccine or curative serum. The industrial bacteriologist finds it much more difficult and often impossible, to maintain pure culture reactions in the large batches of raw materials with which he works. He may, by the use of steam, sterilize his containers before starting runs. Even here, however, he may be unable to insure complete elimination of certain aerobic and anaerobic spore forming organisms, especially the thermophilic, or heat-loving types, which may cause considerable trouble. Where containers are sterilized it is often unwise to sterilize the raw materials, because of their bulk or chemical composition. Sterilization may alter their consistency or chemical structure so as to render them non-fermentable, or it may produce in them an undesirable flavor or odor.

Many foods carry on their surfaces or within them the very micro-organisms essential to their proper cure—for example olives, pickles, and cabbage—and at the same

time harmful organisms may be present if spoilage has occured or unhygienic methods of collection and storage have been used. Sterilization attempted here might kill the desirable types of organisms while permitting the more resistant spoilage forms to survive. In other cases, as with milk products such as cheeses and fermented milks, the raw materials may be pasteurized or sterilized and then seeded with pure cultures of the desired forms. Complete curing is often not due to one type of organism but is the result of symbiotic action of two or more types. These may either work together to produce intensified effects or, as in the case of fermented milks, one group may carry the action to an intermediate product which then becomes the starting point for the action of the second group, as occurs in the production of vinegar.

Depend on Mass Action of Cultures

Because of the factors noted above the industrial bacteriologist accustoms himself to working with predominating cultures or "starters" of desired organisms rather than with pure cultures. He depends on their mass action and on the control of growth conditions, as temperature, acidity and oxygen supply, to keep in subordination the less desirable forms occurring in the raw materials. Thus he strives to obtain maximum yields of desirable end products with minimum amounts of objectionable or interfering substances. He may need to introduce accessory food substances for his organisms. Where "starter" cultures are used, meticulous care should be taken to maintain their purity and freedom from contamination and to keep them in an active condition by controlling their growth reactions. Even where the best "starter" cultures are obtained they will not remain good unless maintained properly. Here the laboratory can materially aid the producer.

Today food processes which depend upon micro-organisms for their preparation cannot be accomplished by any hit-or-miss methods. Micro-organisms vary in regard to their food requirements; they are selective as regards pH range; the question of temperature, humidity and oxygen must enter into consideration. If the producer expects the maximum yield for his product he must produce the optimum conditions for his micro-organisms. This requires constant watching by a scientifically trained man, who has both a working knowledge of microbiology and chemistry. It means continuous experimentation with test batches by a person who keeps in touch with the latest developments. It necessitates the equipping and manning of a research laboratory where such experiments can be made and where control checks can be run in all phases of the system to see that everything is working in harmony. In recognition of the increased interest of producers in scientific control and their increasing request for workers with proper training some of our educational institutions are beginning to offer courses especially adapted to the training of industrial bacteriologists.

British Users of Citric Acid Face Possible Shortage

THE shortage of citric acid in England recently reported by the Chemical Division of the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, should mean opportunity for American manufacturers of this product, particularly in view of the probability that there will be a tendency in Sicily to improve the quality of the lemon output. Only low grade lemons are used in citric acid manufacture and as there has been a steady increase in the demand for lemons as a fruit with the result that more low grade lemons are entering this channel it is almost inevitable that Sicilian producers will accept the economic stimulus and produce better fruit. That will mean a corresponding decrease in the supplies available for acid production.

Great Britain does not produce citric acid by synthetic or bacterial processes, and no relief of the citrate of lime situation is expected from sources outside of Italy, as the West Indies lime crop is understood to have suffered this year and fruit grown in Spain and Northern Africa is not suitable for the production of citrate.

British customs returns show that the importation of citric acid has been relatively small and again reveal the importance of Italy as a supplier. They give the totals of annual imports as follows:

Imported from:	1922 Tons	1923 Tons	1924 Tons	1925 Tons	1926 Tons
Netherlands	49	51	11	3	8
France	28	29	5	7	10
Italy	162	206	226	330	250
United States	61	....	....	....	....
Other sources	15	34	....	10	10
Total	315	324	242	350	278

Such information as is available indicates a general shortage, unless bacterial or synthetic methods of production employed in the United States are capable of putting an exceptionally large supply on the market. In this last possibility there may perhaps lie an opportunity for American entry into the British market. It might also be noted that the present condition of the market should not be regarded as strictly temporary and transitory, for the tendency in Great Britain is distinctly toward a further increase in the consumption of citric acid.

Still another reason for believing this to be a real opportunity is found in the steady increase in the consumption of citric acid in British industry, as demonstrated by the following British Customs returns and legitimate deductions which clearly indicate recent conditions and developments in the market:

Year	Citrate of Lime Imported Long Tons	Citric Acid Produced Long Tons	Citric Acid Imported Long Tons	Citric Acid Exported Long Tons	Citric Acid Consumed Long Tons
1922	1,419	851	315	460	706
1923	1,445	867	324	417	774
1924	1,607	964	242	483	723
1925	1,932	1,159	350	485	1,024
1926	2,495	1,497	278	535	1,240

The citric acid industry in England is based entirely upon the importation of citrate of lime, as the country itself affords no raw materials, and synthetic or bacterial production is unknown. Customs returns, in long tons, which follow, reveal the predominant importance of Italy as a supplier of citrate:

Sources of Supply	1922 Tons	1923 Tons	1924 Tons	1925 Tons	1926 Tons
Italy	1,227	1,265	1,586	1,925	2,439
British West Indies	172	152	18	2	2
Other sources	20	28	13	5	54
Total	1,419	1,445	1,607	1,932	2,495

ABSTRACTS · OF · CURRENT · LITERATURE

SUGAR FACTORY CHARTS. Q. A. D. Emmen. *Archief voor de Suikerindustrie* 37, 382-6, March, 1929. Use of graphic methods is discussed with reference to refinery practice in the cane-sugar industry. One chart should show for any given time the stock of cane one year old. There also should be a straight line showing rate of grinding (assumed to be constant in a given campaign), beginning at a time utilizing cane at least 13 months old. From these two a curve should be plotted showing the age of the ground cane at any time. Examples are cited showing how charts thus made can be used in the factory, and curves plotted as suggested are shown. (This abstract, which also appeared in the July issue, contained an error and is repeated in corrected form.)

* * *

THE EFFECT OF HEAT ON THE ANTINEURITIC VITAMIN OF MILK. Amy L. Daniels et al. *Journal of Nutrition*, vol. 1, May, 1929, p. 455. Tests included various types of milk—evaporated, dried, desiccated, pasteurized and boiled milks. With the exception of milk dried by the roller process, all the superheated milks gave evidence of considerable destruction of the vitamin. Temperature and aeration are important factors in determining the degree of such destructive action.

* * *

EFFECT OF HUMIDITY ON COOKIES. Charles A. Glabau, *Bakers Weekly*, vol. 62, June 1, 1929, p. 75. The method of making cookies is discussed. As the hot cookie cools, water is driven off, but after having cooled, some of the substances present often possess the property of taking on moisture, which causes softening. Moisture-proof wrappers and containers are the solution of this problem.

* * *

FLOUR AS AFFECTED BY MILLING. C. O. Swanson, *American Miller*, vol. 57, May 1, 1929, p. 441. Various milling factors are discussed, including proper conditioning of the grain, relative humidity, moisture content, invisible loss, and composition of mill stream flour.

* * *

DIESEL ENGINES FOR FLOUR MILLS. Orville Adams, *American Miller*, vol. 57, May 1, 1929, p. 443. This discussion is continued from the April issue and presents a summary of cost figures for the operation of Diesel engines in various plants. "The most economical and modern steam plants have a first cost quite equal to oil-engine installation costs with an operating cost at least twice that of the oil engine."

WHY DO BUTTER CREAM MIXTURES BREAK DOWN? Charles A. Glabau, *Bakers Weekly*, vol. 61, 69, June 8, 1929. This trouble is due to release of water held by the foamy structure, and is especially prevalent in summer time. To prevent this breaking down several materials may be used, as gelatin, cornstarch, or milk solids. A permanent emulsion properly prepared in a colloid mill does not break down.

* * *

PRESERVING AND DRYING MILK. Charles A. Glabau, *Bakers Weekly*, vol. 61, 74, June 8, 1929. Powdered milk has a number of advantages: (1) Due to its concentration, it reduces the cost of transportation and packing to a minimum; (2) it has good keeping qualities, lasting almost indefinitely at room temperature; (3) it is easily handled as a dry substance and can be made into solutions of any composition.

* * *

PACKAGING FLESH PRODUCTS FOR QUICK-FREEZING. Clarence Birdseye, *Industrial and Engineering Chemistry*, vol. 21, 573, June 1929. Desiccation and oxidation are important causes of deterioration of flesh products during cold storage. Packaging before freezing in a moisture-vapor-proof and air-tight covering is desirable. Good packaging materials were tested and moisture-proof cellophane found to be most resistant to moisture. A suitable corrugated fiber board shipping case is described.

* * *

ACID OR ALKALINE. Charles A. Glabau, *Bakers Weekly*, vol. 61, 76, June 15, 1929. Cake mixtures are discussed with reference to their reaction, whether they should be neutral, acid or alkaline. Most leavening agents used in cake leave a neutral or a very slight acid reaction. Sometimes an alkaline reaction is desirable to give best results. Photographs illustrate the effect of increased alkalinity upon the texture and shape of the cake.

* * *

IRRADIATED ERGOSTEROL — A REMINDER. Editorial, *Journal of American Medical Association*, vol. 92, 2023, June 15, 1929. Irradiated ergosteral given in massive doses may result in considerable impairment of nutrition, loss of weight, pronounced hypercalcemia, and abnormal calcium deposits in certain tissues and organs. The warning of the U. S. Public Health Service investigators seems sane at this time: "Of course we would not be understood as deprecating the therapeutic use of irradiated ergosterol, but would rather call attention to the possible harm that might result from too large doses."

MOLD PREVENTION. *Bakers Weekly*, vol. 61, 63, June 22, 1929. Mold growth is favored by warmth, moisture and darkness. Infection may be eliminated by thoroughly cleaning the shop from the roof to the floor. Rinsing water should include some sterilizing substance, such as sodium hypochlorite.

* * *

WHY DO FILLINGS AND CUSTARDS LIQUEFY? Charles A. Glabau, *Bakers Weekly*, vol. 62, May 25, 1929, p. 71. Liquefaction may be due to improper preparation of highly acid fruit fillings, or to the filling having been raised to the boiling point in the oven or, more often, to enzyme action of yeast and bacteria which are present. The last named usually is an infection from the air or due to lack of clean—i.e., sterilized — containers for the fillings.

* * *

PRACTICES IN A BRITISH MILL LABORATORY. By "A British Cereal Chemist." *American Miller*, vol. 57, May 1, 1929, p. 439. The first article of a series discusses three tests which are in general use in British mills: (1) moisture, (2) protein, and (3) a "maltose figure" obtained by a modification of the Kent-Jones method. This third value is definitely correlated to the gas-producing power of the flour.

* * *

BEET MOLASSES. Erich Gundermann. *Chemiker-Zeitung* 53, 305-7, 322-3, April 17 and 24, 1929. The harmful effect of colloids in beet sugar solutions on refining processes is an old familiar problem and practical remedies have long been applied; but very little is known about the true nature of the colloids themselves. Experiments have shown that the colloids occurring in beet molasses and like solutions are negative, and that they can be flocculated by acid. With hydrochloric acid the optimum concentration, both for rate and amount of flocculation, is at about pH=3.2, but a higher acidity will still effect partial flocculation. Rate of flocculation and particle size are favored by warming and by presence of coarse particles—e. g., by using a solution not previously filtered. Up to about 40 per cent dry substance, increasing density of the molasses also favors flocculation; at higher densities this effect begins to disappear. The absolute quantity of flocculated colloid increases with rising density, but the ratio of flocculation to dry matter present is greater in more dilute solutions. The flocculation not only clarifies the solution but improves its color and filtering properties. These effects also are greatest when the pH is about 3.2. The experimental results

lead to the conclusion that the best purification effect is obtained in sugar juices and sirups by treatment with sulphur dioxide at a concentration very close to the inversion limit. The chemical composition of the colloidal impurities is not yet fully known; there probably are several kinds precipitable by acid. The evidence points rather to the humins than to colloids of the caramel type.

* * *

USE OF MILK IN BASIC SWEET DOUGHS. Washington Platt. *Bakers Weekly,* vol. 62, June 1, 1929, p. 83. The results of this investigation answer the following queries: (1) the best way to mix a basic sweet dough containing powdered milk; (2) the best amount of milk to use; (3) benefits derived from the use of milk; and (4) changes that should be made in the method of mixing and handling such a dough containing large amounts of milk so as to obtain best results.

* * *

BITTERNESS IN WINE. E. Voisenet. *Comptes rendus de l'Academie des Sciences,* 188, pp. 1271-3, May 6, 1929. From a sample of the wine whose bitterness caused producers in Burgundy much difficulty, a substance was finally isolated which made water distinctly bitter in a dilution of 1:20,000. By careful analysis and examination of its properties this substance was identified as divinyl glycol. Its presence is attributed to hydrogenation, under the influence of reductases developed from yeast, of the acrolein which has sometimes been blamed for the bitterness. This glycol oxidizes in air, which explains why infected wine loses its bitterness slowly on standing in air. Attention of the fermentation industries is directed to this case, because it takes only a few centigrams per liter of the glycol to impart a pronounced bitterness.

* * *

RENNIN ACTION. G. A. Richardson and L. S. Palmer. *Journal of Physical Chemistry,* 33, pp. 557-76, April, 1929. A physico-chemical study has been made of the action of rennin in clotting milk, particularly in relation to electrokinetic phenomena. Clotting is a result of conversion of calcium caseinate to calcium paracaseinate; and evidence from comparison of synthetic caseinate and paracaseinate sols would indicate that the decrease in stability of the milk suspension is merely due to lowering of the charge on the calcium caseinate micellae. Experiments have been made with calcium caseinate and calcium caseinate-calcium phosphate sols by cataphoretic methods. The isoelectric point of rennin was found to lie between pH 6.9 and 7.0; and addition of rennin to calcium caseinate sols from pH 6.1 to 6.9 does actually lessen the rate of migration of the micellae, probably because of a lowering of the charge upon them. Above pH 7.0 the addition of rennin increases the rate of migration. Previous heating of the calcium caseinate sol causes the migration rate to be increased, which is in accord with the known effect of heat treatments on the clotting behavior of milk. Rennin will slow down the migration in a heated calcium caseinate sol, but not as much as in the unheated sol. This explains why calcium chloride facilitates the clotting of boiled milk by rennin.

* * *

REDUCING THE REFRIGERATING PROBLEM. P. G. Pirrie. *Bakers Weekly,* 61, 57, March 2, 1929. Desired dough temperature may be obtained by proper storage temperatures for all ingredients. Often refrigeration must be used to cool the dough. This can be avoided in many cases by proper storage of the flour and use of cold water when mixing.

* * *

PORTO RICAN SUGAR. *Sugar,* 31 pp. 287-90, July, 1929. As an example of a modern refinery for production of high-grade white sugar, the Mercedita Central of the Porto Rican American Refinery is described and illustrated. Electric power is used throughout, including the battery of centrifugal driers, which are belt-driven from individual motors. The power is generated with two 500-hp. oil-fired Babcock & Wilcox boilers, driving a 750-kw. turbine. The boiler feed water is softened by the Neckar system. Decolorizing of the raw sugar is effected with Suchar, in six Auto filters, especially designed to operate in accordance with the Suchar system. These filters operate at 15 to 30 lb. pressure, and with new or freshly revivified carbon they give a filtrate which can be used in as many as five boilings of refined white sugar. The progress of the sugar, from its raw state to the pure white product, is followed and the cycle passed through by the Suchar is explained.

* * *

FOOD COLORS. L. Whinyates. *Canadian Chemistry and Metallurgy,* 13, pp. 163-4, June, 1929. In coloring foods, three main considerations must be met: conformity to laws to which the product will be subject; safety for manufacturer and consumer, and stability of the color in the product. Foods to be colored are in general of three kinds: transparent (beverages, gums, boiled sweets), opaque (ice cream and confections), and butter. In transparent products there is some difficulty due to fading, especially in those which have been bleached with sulphur dioxide. In these, destruction of residual sulphur dioxide with cream of tartar is preferable to using an excess of coloring agent. The fading difficulty in opaque goods is complicated by the fact that these commonly contain very little water. In such a case, glycerin is often used to help maintain the color strength. Argentina is now the only important country which prohibits the use of synthetic food colors. The British regulation prohibits harmful colors, specifically mentions a few of these, and prescribes tolerance limits for certain of the heavy metals. This is much harder to interpret than the American regulation, with its definite list of permitted colors (now fourteen in number) and its specifications for tests and analysis. The Canadian permitted list includes twelve dyes, of which ten are also in the United States list. Australia and New Zealand have also based their regulations on those of the United States.

* * *

GOSSYPOL. E. P. Clark. *Oil & Fat Industries,* 6, No. 7, pp. 15-9, July, 1929. The Food Research Division, Chemical Technology and Research, U. S. Bureau of Chemistry and Soils, reports progress of the past year of gossypol research. An improved method of preparing gossypol from cottonseed has been worked out, and numerous feeding tests on rats have been made. Growth curves are shown. White rats are sensitive to the toxicity of free gossypol, and can be used in biological assays of cottonseed meal. Bound gossypol in itself is not harmful to rats. Growth rates were less with autoclaved meal (Menaul process) than with untreated meal. The findings are discussed as related to practical stock feeding.

* * *

LACTIC ACID. Omega. *Chemical Trade Journal,* 84, pp. 559-60, 581-2, June 14 and 21, 1929. Commercial production of lactic acid dates back to about 1870. Milk products, originally used, gave low yields and were replaced by starchy materials; but recent researches indicate that whey or buttermilk may again come into commercial use. In present commercial practice the process has three major stages: saccharification, fermentation, and recovery of lactic acid from the fermented liquor. The starch is macerated with 2 parts of cold water, then with 6 parts of boiling water for thorough sterilization. Diastase is used for the saccharification. Calcium carbonate and sterilized skim milk are added to the wort before it is inoculated with the lactic ferment. The lactic acid, as formed, settles to the bottom as a sludge of calcium lactate. The lactic acid, liberated from this sludge by acidification, is filtered, decolorized with charcoal, filtered and evaporated to a concentration of 50 per cent. The yield per 100 lb. of starch is about 135 lb. of this 50 per cent solution. The acid has numerous technical uses (in textiles, tanning, and as its esters or other derivatives in lacquer manufacture and in medicine) other than in food products. The edible grade is finding increasing use instead of tartaric and citric acids in beverages, in making pectin and for like purposes. Acid lactate is used also instead of cream of tartar.

· CRITICAL · BOOK · REVIEWS ·

HANDBOOK OF REFRIGERATING ENGINEERING. By W. R. Woolrich. D. Van Nostrand Company, Inc., New York; 331 pp. Price $4.

IN THIS handbook Professor Woolrich has achieved a twofold purpose, for it is both a book of reference and a text book with which one with a fair amount of engineering knowledge should be able to master the theory and practice of refrigeration.

As a reference book it is particularly valuable, for in one volume is assembled a great amount of data that have come from a variety of sources such as manufacturers of refrigerating machinery and especially from the American Society of Refrigerating Engineers. All of these data are correlated and interpreted with examples to show how they are to be correctly used. The chapter on food preservation and cold storage is one that will be of interest to all who have to utilize refrigeration as a preservative, giving proper temperatures and methods of handling. The uses of the principal refrigerants, such as ammonia, carbon dioxide and sulphur dioxide, in both compression and absorbtion systems are well discussed together with a short review of the lesser used refrigerants, such as methyl and ethyl chlorides and the lower hydrocarbons.

In one respect, however, the book is somewhat lacking, for it has no treatment of the problems of low-temperature refrigeration which are of such great interest today in the rapidly developing quick freezing process and are likely to become rather widespread in their use. While this phase of refrigeration has not been discussed in the book its absence can hardly be called a deficiency but rather a limitation. It is a handbook and not an exhaustive treatise. For the practical refrigerating engineer or the student the book contains much of value and is remarkably free from errors.

L. V. BURTON.

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HANDBOOK OF CHEMISTRY AND PHYSICS, Thirteenth Edition. By Charles D. Hodgman and Norbert A. Lange. The Chemical Rubber Publishing Co., Cleveland, Ohio; 1,214 pages. Price $5.

THIS familiar and always useful handbook has again been brought up to date in the thirteenth edition, with the section devoted to the specific gravity of aqueous solutions revised and enlarged. A section devoted to ceramics has been added to the book and also alcohol tables in which the figures for density are compared with water at the *same* temperature. Three sets of such figures occur: for 15, 20 and 25 deg. C.

The various tables given in this book include the following: Mathematical; general chemical; properties of matter; heat; hygrometric and barometric; sound; light; miscellaneous; definitions and formulas; laboratory arts and recipes; photographic formulas; measures and units; wire tables; problems.

L. V. BURTON.

* * *

RECENT ECONOMIC CHANGES IN THE UNITED STATES. A report by the Committee on Recent Economic Changes, of the President's Unemployment Conference, of a survey made by the National Bureau of Economic Research. McGraw-Hill Book Company, New York; 2 volumes, 950 pp. Price $7.50 for the two volumes.

UNDER the heading "What Americans Eat," published in the July issue of *Food Industries*, the chapter of this work devoted to the standard of living was reviewed editorially and in detail. It is of interest to know that the report as a whole gives in condensed form an accurate picture of our entire economic structure and as such will well repay careful study by executives in all branches of industry.

Following the report of the Committee will be found twelve chapters dealing with the detailed investigations made by the Research Bureau. These are under twelve chapter heads covering the following topics: Consumption and the Standard of Living, Industry, Construction, Transportation, Marketing, Labor, Management, Agriculture, Price Movements, Money and Credit, Foreign Markets and Foreign Credits, and National Income and Its Distribution. The chapter on industry is divided into three parts, the first being prepared by Dexter S. Kimball on "Changes in New and Old Industries," the second by L. P. Alford on "Technical Changes in Manufacturing Industries," and the third part by Willard L. Thorpe on "The Changing Structures of Industry."

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Agricultural Yearbook, 1928. Issued by U. S. Department of Agriculture. $1.50. Includes numerous technical reviews of novel agricultural developments, including researches of the government and the usual complete statistical résumé of production and market data.

Trade Organization Directory. Bureau of Foreign and Domestic Commerce Series 5, revised edition, 1929. Sixty cents. A list of the commercial and industrial organizations of the United States, so arranged as to indicate national and general organizations as well as state and local for the trades, industries, and functions represented.

Salmon. U. S. Tariff Commission Tariff Information Survey G-18. Twenty cents. Tariff information surveys, including considerable technical discussion and a résumé of economic factors bearing on the fresh, frozen, canned, and salted products made from the salmon.

U. S. Fisheries Industries, 1927, by Oscar E. Sette and R. H. Fiedler. U. S. Bureau of Fisheries Document 1050. Twenty-five cents. A résumé of all fisheries statistics for the calendar year 1927, superseding the preliminary and partial statistics previously issued by months and longer intervals, and affording the most convenient permanent reference form for these data.

Beef Production on the Farm, by W. H. Black and E. W. McComas. U. S. Department of Agriculture Farmers' Bulletin 1592. Five cents. A popular presentation for farmers' use suitable for distribution by meat packers to their prospective suppliers in the agricultural territory.

Food Animals and Meat Consumption in the United States, by John Roberts. U. S. Department of Agriculture Department Circular 241. Five cents. A statistical résumé giving data through 1928 for meat and lard.

Live Poultry Marketing in New York City, by F. A. Buechel. U. S. Department of Agriculture Technical Bulletin 107. Fifteen cents. A discussion of trade conditions and factors affecting prices.

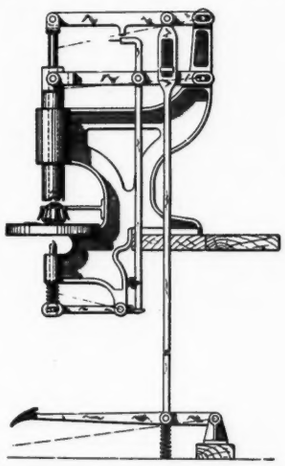
Fish Oil as an Adhesive in Lead-Arsenate Sprays, by Clifford E. Hood. U. S. Department of Agriculture Technical Bulletin 111. Ten cents.

Distribution of Classes and Varieties of Wheat in the United States, by J. Allen Clark and associates. U. S. Department of Agriculture Department Bulletin 1498. Twenty cents. An elaborate statistical inquiry with numerous maps showing geographical factors.

Handbook of Foreign Tariffs and Import Regulations; I—Fresh Fruits and Vegetables, by Robert S. Hollingshead and Roberta P. Wakefield. Bureau of Foreign and Domestic Commerce Trade Promotion Series 79. Twenty cents. The first of a series of booklets intended to facilitate foreign marketing of American agricultural products. Subsequent numbers in this series will cover canned foods, dried fruits, cereals, meats, etc. Such subsequent parts will be announced in FOOD INDUSTRIES when issued.

· SELECTED · PATENTS ·

Prune Pitter—Thomas W. W. Forrest, of Fresno, Calif., and Thomas O. L. Smith, of Oakland, Calif., to Sun-Maid Raisin Growers Association of California. No. 1,715,700. June 4, 1929—A cut is made in the skin of the prune



next to one end of the pit so that the pit is pointed toward the cut. By exerting pressure against the opposite side of the prune the pit is expelled through the cut without breaking or puncturing the skin in any other manner.

* * *

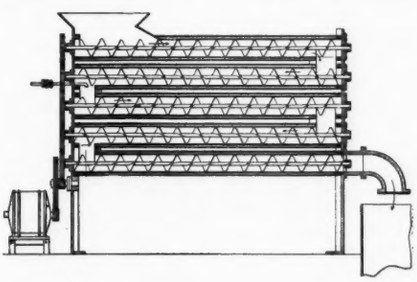
Soluble Chewing Gum—Leon W. Stetson, Cranston, R. I. No. 1,700,387. Jan. 29, 1929—Chewing gum which will disappear with continued chewing, consisting of wheat gluten, hydrogenated peanut oil and water in substantially equal proportions combined with a smaller proportion of glucose.

* * *

Bacterial Method of Dealcoholizing Beer—Valentine Gilbert, of Virginia City, Mont. No. 1,717,920. June 18, 1929—The alcohol is removed from regular beer, which may contain up to 3½ per cent or more of alcohol, by fermenting it with bacteria such as *Bacillus Delbrückii* or one of the other vinegar bacteria. The alcohol, converted into acetic acid, is neutralized by the addition of a suitable carbonate, the neutralization being carried out to any degree of acidity desired.

* * *

Continuous Processed Cheese Machine—A. S. Kux, Chicago. No. 1,713,537. May 21, 1929—A continuous machine for grinding, mixing, blending and pasteurizing cheese by passing it through a series of jacketed tubes equipped with worm conveyors. An inlet is supplied to introduce water at the proper point.

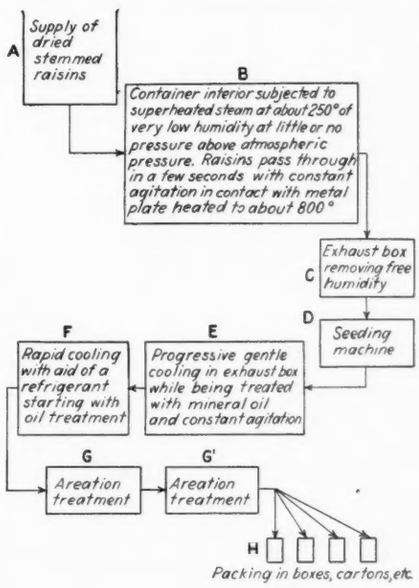


* * *

Preparation of Fresh Fruit for Market—Ernest M. Brogden, Santa Monica, and Miles L. Trowbridge, Palms, Calif., assignors to Brogdex Company, Winter Haven, Florida. No. 1,693,575. November 27, 1928—A method of preventing gray or white deposits of borax crystals on the surface of fruit treated with a solution of borax to prevent development of blue mold during shipping and storage. A small amount of soap is added to the borax treating solution to inhibit crystallization of the borax.

* * *

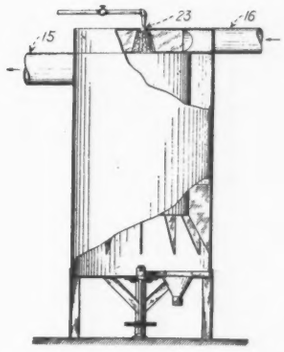
Non-Sticky Raisins—Thomas W. W. Forrest, Oakland, Calif., to Sun-Maid Raisin Growers of California. No. 1,711,728. May 7, 1929—Stickiness and exuded sirup from raisins is the result


A
Supply of dried stemmed raisins
B
Container interior subjected to superheated steam at about 250° of very low humidity at little or no pressure above atmospheric pressure. Raisins pass through in a few seconds with constant agitation in contact with metal plate heated to about 800°
C
Exhaust box removing free humidity
D
Seeding machine
E
Progressive gentle cooling in exhaust box while being treated with mineral oil and constant agitation
F
Rapid cooling with aid of a refrigerant starting with oil treatment
G
Areation treatment
G'
Areation treatment
H
Packing in boxes, cartons, etc.

of the heat and moisture applied to soften the raisins for seeding. By the new process muscat raisins are produced which have a soft consistency and will remain separate or free running, and will be puffed up to about 16 or 20 per cent greater volume than the same grade of raisins as treated by prior processes. Treatment consists of a rapid superficial heating in a superheated atmosphere of low humidity; seeding; gentle cooling; rapid terminal cooling; aeration; and treatment with a tasteless mineral oil during the cooling process.

* * *

Spray Drying—W. S. Bowen, Westfield, N. J. No. 1,711,306. April 30, 1929—Spray drying apparatus as shown in the drawing. Hot air enters in pipe 16 and is directed vertically into the spray cone 23, and the circulation of hot gases is downward in the central tube, where separation of the dried material



takes place. The exhaust is upward through the outer shell and out through pipe 15. An important feature is claimed to be the location of the spray nozzle outside of the heating zone, which prevents clogging.

* * *

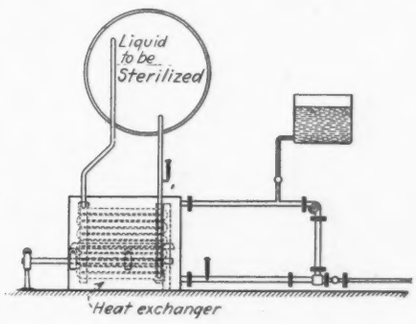
Improved Cereal Beverage—Herman Heuser, of Evanston, Ill., to United States Process Corporation, of Chicago. No. 1,717,685. June 18, 1929—Beer is concentrated and subjected to a yeast fermentation which produces a product of exceptionally strong beer flavor. This in turn can be added to dealcoholized beer to produce a product having all of the flavor of real beer.

* * *

Removing Bleaching Chemicals From Fruit—S. Blumenthal, of Brooklyn. No. 1,717,869. June 18, 1929—A method of removing sulphur dioxide and similar substances from fruits, replacing the old process of washing in water for a period of from four to ten days. The removal of the SO_2 radical is accomplished by treatment with a small quantity of an oxidizing salt such as ammonium persulphate, benzoyl peroxide and the like. One-half pound of ammonium persulphate is sufficient for the treatment of 250 lb. of bleached fruit. The SO_2 is converted into SO_3 and neutralized with an alkali carbonate followed by subsequent washing.

* * *

Sterilizing Liquids Without Overheating—Carl A. Hartung, Berlin, Germany. No. 1,714,366. May 21, 1929—To avoid the injurious effects of overheating liquids when sterilizing them, the process is that of heating from another liquid kept at a temperature only two or three degrees above the



proper sterilizing temperature. The heat of one is communicated to the other through a heat exchanger.

* * *

Coffee Preparation—Thomas M. Rector, of New York, to Vitapick Corporation, of New York. No. 1,716,323. June 4, 1929—Roasted coffee is ground in an oil medium until it is extremely fine. The ground paste is placed in a filter press and the excess of oil removed. The filter cake, then pulverized and used for making coffee, is so finely pulverized that it will all remain in suspension. The oil, which is recovered by pressing, is used over and over again.

* * *

Bread Formula—Jean Matti, of Pully, Switzerland, to Augmentine Holding S. A., of Lausanne, Switzerland. No. 1,701,580. Feb. 12, 1929—A bread formula which is stated to yield bread about 7½ per cent greater in weight after baking than the ordinary processes of manufacture. One hundred parts of flour, 66.5 parts of water, 2 parts of salt, 1 part of yeast are mixed at a temperature of from 38 to 40 deg. C., adding 0.1 part of an edible neutral fatty substance, fermenting, molding, proofing and baking for about one hour.

* * *

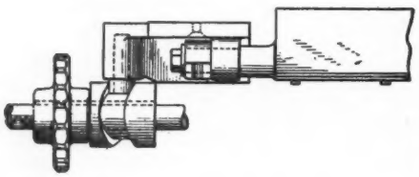
New Method of Making Cheese—William D. Richardson, of Chicago, to Swift & Company, of Chicago. No. 1,711,032. April 30, 1929—A new cheese product produced without wastage of byproducts in the form of whey. A concentrated milk preparation is made by mixing either evaporated milk, powdered milk or whole milk so regulated that the moisture content is the same as that of the cheese which is to be made. From 0.005 to 0.05 per cent of calcium chloride is added to the mix in order to permit the rennet to coagulate the milk preparation. Suitable starters also are added at this time. The manufacture of the cheese is normal from this point onward.

* * *

Preserving Citrus Fruit Juices — Vaman R. Kokatnur of New York City. No. 1,715,932. June 4, 1929—A method of preparing and preserving citrus fruit juices, such as orange juice, in a manner in which the flavor is not impaired. Oranges are pressed and then from one-fourth of the orange skins an extract is made by grinding the skins to a pulp and mixing with water for fifteen minutes in the proportion of one-half pint of water for each two whole skins employed. Five to 10 per cent of the skin extract is added to the juice before pasteurizing. The latter process is carried out at 45 to 55 deg. C. for a period of about 2½ hours.

* * *

Improved Knife for Drum Driers—Bohumil Bouda and George S. Skelton, of Clinton, Iowa, to the Collis Company, of Clinton, Iowa. No. 1,717,491. June 18, 1929—An oscillating knife for use on drum driers which will prevent grooving of the drums.



Food Products—Scott H. Perky, Summit, N. J. No. 1,717,401. June 18, 1929—Patent covers any food product having sections of ribbons, either plain or corrugated, rolled into a cylinder.

* * *

Sugar Refining—Ralph W. Shafor, of Denver, Colo. No. 1,713,925. May 21, 1929—An improvement over the Steffen process of recovery of sugar from beet molasses, by the continuous production of insoluble tricalcium saccharate. The invention depends upon the discovery of the fact that the reaction proceeds by two stages, producing first a soluble calcium saccharate and then the insoluble tricalcium saccharate.

* * *

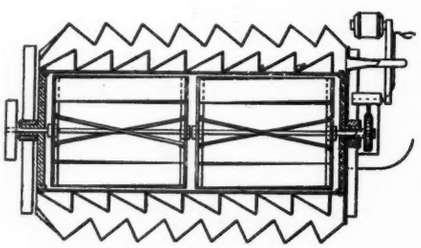
Incorporating Yeast in Chewing Gum —H. M. Mowrey, of Toledo, Ohio, to the United Chicle Company, of Toledo. No. 1,711,281. April 30, 1929—A method of incorporating powdered yeast in chewing gum without starting a fermentation that would ruin the gum.

Copies of Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Elbow Macaroni Drier — Joseph Triulzi, of Los Angeles, Calif., to Braly Manufacturing Company, of Los Angeles. No. 1,711,188. April 30, 1929—A rotary drier for elbow macaroni in which the preliminary drying is carried out in



a continuous process and is followed by the usual tray drying. The drier is set horizontally, but by means of suitable baffles the material progresses slowly through a drum which revolves at ½ r.p.m. The drier is in reality two concentric cylindrical screens with a revolving fan inside.

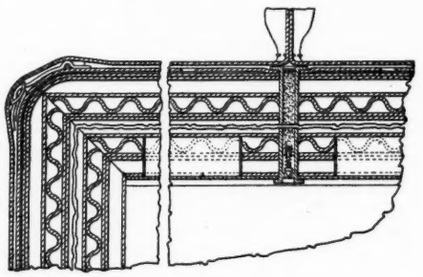
* * *

Preparation of Spaghetti Especially for Canning—Dominic Di Leonardo, of Pittsburgh, Pa. No. 1,716,966. June 11, 1929 — Instead of carrying spaghetti through the usual long drying operations the drying is carried only sufficiently to permit ready handling of the material without the individual pieces sticking together. It then can be cooked and placed in cans in the same manner as the older long drying process.

Concentrated Onion Juice—Carl Marx, of Chicago, one-half to Rudolph Weiss, of New York. Reissue No. 17,324. Reissued June 11, 1929 — Concentrated onion juice is made by washing, peeling and grinding onions to a fine pulp, after which they are put into a distilling apparatus. The first distillation is at atmospheric pressure, and a fraction amounting to 10 per cent of the whole is collected which contains the more volatile constituents. Next a vacuum distillation is carried out which reduces the total volume to one-half of the original. The distillate is discarded. Infusorial earth is then stirred into the concentrated onion pulp and it is filtered mechanically. The clear liquid can be further concentrated if desired. The filtrate is mixed with the first fraction containing the volatile constituents, and then bottled and pasteurized, sterilized or treated with sodium benzoate.

* * *

Ice Cream Shipping Container—D. J. O'Brien, Manhattan Beach, N. Y., to Thermopak Company, Inc., New York. No. 1,713,348. May 14, 1929—A shipping container for cans of ice cream for use in conjunction with solid carbon dioxide. The cut shows the details of construction and the location of the valve to allow the evaporated carbon dioxide to escape in order to prevent an accumulation of pressure.



* * *

Cannery Waste Disposal — John T. Travers, of Columbus, Ohio. No. 1,711,105. April 30, 1929—Colloid materials in cannery waste are precipitated by the following procedure: The sewage is rendered alkaline with lime and then treated with an ionizable metallic salt of calcium and a coagulant. All of the three steps of the treatment may be combined into a single reagent, if desired. Measured by the biological oxygen demand, the efficiency of this form of treatment is around 90 per cent and produces a sludge which is valuable as a fertilizer.

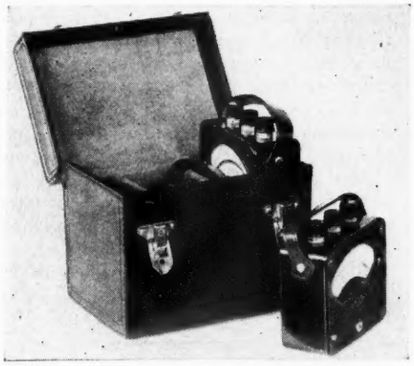
* * *

Yeast Food—Charles B. Hill, of Glencoe, Ill., and Maurice H. Givens, of Evanston, Ill., to Northwestern Yeast Company, Chicago. No. 1,702,259. Feb. 19, 1929—A yeast food containing two parts of ammonium sulphate, one part calcium sulphate, one part calcium phosphate. All are intimately ground in the form of a fine powder and are used in the proportion of 0.2 per cent of the total flour used in the dough. The theory underlying their use is that the yeast cells feed upon the basic radicals of the ammonium sulphate and calcium sulphate, setting free the acid radicals which now render soluble the previously insoluble calcium phosphate.

MANUFACTURERS' · NEWS · AND · EQUIPMENT

Portable Electrical Instruments

WESTINGHOUSE Type PX-4 portable d-c. instruments may now be had in handy leather carrying cases. The meters operate on the D'Arsonval principle and are designed for general testing purposes where medium-sized,



light-weight instruments may be advantageously used. Each meter is inclosed in a molded Micarta case 4½ x 4½ x 2 in. The Micarta cases provide ample protection against shock, acid, moisture, or other deleterious agents.

Each meter occupies a separate compartment in its leather carrying case. Despite its three compartments, each carrying case is compactly designed, its over-all size being only 6½-in. wide by 8¾-in long by 7¼-in. deep. The complete outfit is of great benefit to the tester or maintenance man. The meters will give accurate, dependable service, while the leather cases provide a convenient, safe means of carrying and storing the instruments.

New Line of Insulating and Protecting Lacquers

FOR sealing joints in gas mains, for painting structural iron, motors, oil tanks, metal parts of ships exposed to oil or vapors, fire hydrants, ship hulls, mine machinery and similar equipment requiring sealing and insulating paints, the General Electric Company is offering a series of lacquers in colors, for use where an oil-resistant, highly protective, durable and flexible insulating coating is demanded. The base of the new lacquers is an alkyd resin produced from phthalic anhydride and glycerine developed in the research laboratories of the General Electric Company, and marketed by that company under trade name "Glyptal."

The paints possess many desirable qualities, including resistance to acids, mineral oils, weather, and alkalies, tenacious adhesion to any surface—including galvanized iron and aluminum—and protection against rust. The Glyptal lacquers have been found superior to many ordinary protective paints because they are more easily applied, dry faster to a coating of pleasing appearance, are more resistant to acids and mineral oils, and are less affected by high temperatures. They withstand temperatures destructive to, and have a dielectric strength greater than, the commonly used paints.

These new lacquers are now available in five colors—red blue, brown, green, and aluminum. They may be applied by brushing, spraying, or dipping, dry dust-free in about 30 minutes, and in approximately ten hours to a hard, smooth finish which is not brittle and which is easily cleaned. When using Glyptal lacquers as a finish, no priming or sizing is necessary.

New Water Level Indicator

PLANT managers and superintendents have doubtless often wondered just how a fireman or water tender standing before a high boiler could always be certain of the water level with the gage glass far above his head. With the increase in pressures, size of boilers and height of boiler settings it is becoming still more difficult to read the water level. The Combustion Engineering Corporation has met this problem by its new C-E water level indicator, which does not replace the gage glass on the water column but rather supplements it with an indicator at a height convenient for easy reading.

By referring to Fig. 1 it will be seen

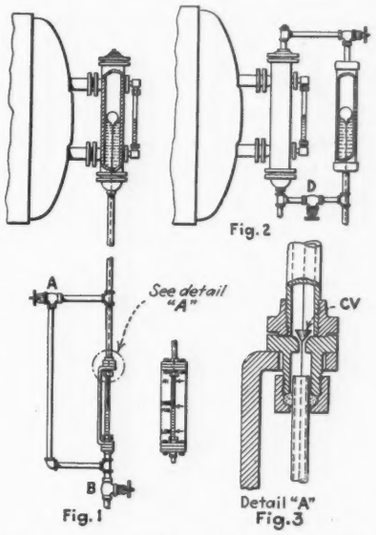


Fig. 2

Fig. 1

Detail "A"
Fig. 3

that a float inside the water column moves a non-corrosive wire up and down a pipe that reaches down to the indicator proper in front of the operator's face. Fig. 2 shows a different arrangement of the column so that the indicator may be installed vertically. The indicator is a gage glass with a small marker inside that moves up and down corresponding to the movements of the float in the water column above. The apparatus is always filled with cold—not hot—water, a condition that assures long life of the glass. In case the lower glass should break the valve *CV* shown in Fig. 3 will close. When a new glass is inserted the valve *A* is opened to equalize the pressure above and below *CV*, and the indicator resumes its normal operation.

Manufacturers' Latest Publications

Unless stated otherwise in the text, free copies of these publications may be obtained from the manufacturer by readers of FOOD INDUSTRIES *who mention our journal in connection with their request.*

Electrical Equipment. — Bulletin GEA-1121, reciprocating air compressor sets, single-stage, portable; GEA-1118, reciprocating air compressor sets, single stage, stationary; GEA-214-A, G-E helical sheath-wire immersion heaters; GEA-1120, reciprocating air compressor sets, two-stage, stationary; GEA-594-A, G-E automatic control panels for industrial electric heating; GEA-1114, solenoid-operated valves for the remote control of liquids and gases under pressure; GEA-788-A, type FT normal starting torque, full-starting voltage, general-purpose, squirrel-cage motors; GEA-181-A, a.c. inclosed magnetic switches for alternating-current motors; GEA-1106, magnetic switch across-the-line starter for induction motors with motor circuit switch and fuses; GEA-517-B, totally inclosed, fan-cooled, d.c. motors; GEA-913-A, automatic time switches, motor operated. General Electric Company, Schenectady, N. Y.

Essential Oils, Flavors and Perfumes. Fritzsche Brothers, Inc., 78 Beekman St., New York City—June price list.

Truck Tires. Hood Rubber Company, Watertown, Mass.—Reprint from the March issue of the *Hood Redman* describing Hood's new giant-pneumatic tires.

Filter Presses. T. E. Shriver & Company, Harrison, N. J.—General catalog No. 29 describing filtration and filter press equipment including accessories. 36 pages.

Liquid Measuring Apparatus. Liquidometer Corporation, Skillman Ave. and Hulst St., Long Island City, N. Y.—Catalog describing the deGiers Liquidometer, distance-reading, tank gages. Liquidometers work under pressure, vacuum, or in heated tanks.

Fire Underwriters Valves. Jenkins Brothers, 80 White St., New York City—Circular 132 describing valves for fire protection service.

· NEWS · ITEMS ·

Outlook Is Promising For Fall Business

THE volume of current business in the food manufacturing industry of the country as a whole appears to be on a slightly higher plane than it was at this time last year, according to opinions expressed by members of the Council on the Trend of Business, an organization composed of 5,600 leading executives in all lines of business and industry, of whom over 700 manufacture or distribute food products. These men state that their volume of business at the close of July was of about the same proportions as at the close of June and about 1 per cent above that at the close of last July.

Near future business is particularly bright, the members of the Council expressing the opinion that the average volume of business during the next 90 days will exceed the current volume by about 6 per cent, and will exceed the volume witnessed during the same 90-day period last year by 2 per cent. If these expectations are realized the food products industry as a whole will witness a very profitable summer and early fall season.

Every section of the country, except the St. Louis district and the East South Central States, reports a volume of current business in the food industries at the close of July over that witnessed at the same time last year, and every section with the exception of New England anticipates during the next 90 days an average volume of business of larger proportions than that at the close of July.

Economic conditions in the agricultural industry have assumed the leading position during the past month as the most favorable factor underlying American business. This rather sudden rise in influence on the part of agriculture is due to a combination of causes, including good crop prospects throughout the country except in the Northwest, which has been without sufficient rain, cutting materially into the wheat crop prospects; the advance in prices of farm products generally during the past month; and the passage of "The Agricultural Marketing Act," with the subsequent appointment of a commission eminently satisfactory to agricultural interests, and inspiring the confidence of business men as a whole.

Back of this improved agricultural sentiment is the personality of President Hoover, with his demonstrated understanding of business, industrial, and agricultural conditions, coupled with his apparent ability to solve the problems through direct attack. Seldom has confidence in the future been more prevalent in all branches of American business and industry. Other favorable factors are a continued high rate of employment during a season of normally slack employment; low inventories and volume turnover; easier conditions in the money market; continued high consumer purchasing power; and a decrease in stock-market gambling on the part of the public.

On the unfavorable side the uncertain condition in the money market leads—with comparatively high money rates and lack of funds for small mortgage loans but with apparently sufficient funds available for legitimate business of the larger type. Stock market gambling is still being maintained on too large a scale on the part of the public. Other unfavorable factors are uncertainty as to the final provisions of the new tariff bill; comparatively low level of building construction; excessive installment buying, especially of non-essentials; chain-store competition; and the tendency toward extravagance and high living that seems to permeate all levels of society.

Golden State Expansion

The Golden State Milk Products Company is reported to be acquiring the California Milk Company, of San Francisco. During the past year the Golden State company has acquired twelve concerns near San Francisco and nine in southern California. The combined annual business is now at the rate of $50,000,000.

COMING EVENTS

AUGUST

17—Missouri-Illinois District Association of Operative Millers, St. Louis.

SEPTEMBER

7—Texas-Oklahoma Association of Operative Millers, Fort Worth.
9-13—American Chemical Society, Minneapolis.
23-27—American Bakers' Association, Annual Convention, Chicago.
25-27—Pennsylvania Millers' State Association, Harrisburg.

OCTOBER

8-10—Wisconsin Buttermakers' Association, Chippewa Falls, Wis.
12-19—National Dairy Exposition (Dairy Cattle), St. Louis.
21-23—International Association of Ice Cream Manufacturers, Toronto.
21-26—Dairy Industries Exposition, Toronto.
24-26—International Association of Milk Dealers, Toronto.
28-30—Fourth Annual Convention, Mayonnaise Products Manufacturers' Association of America, Atlantic City.

NOVEMBER

11-15—American Bottlers of Carbonated Beverages, Atlantic City.
16-22—Pacific Slope Dairy Show, Oakland, Calif.
19-20—National Creamery Buttermakers' Association, St. Paul.

Simplification Program for Tight Cooperage

The National Bureau of Standards announces that the proposed simplified practice recommendation for tight cooperage and tight cooperage stock (wooden barrels and kegs) developed by a general conference of interested elements of the industry on May 16, is now being sent to manufacturers, distributors and representative users for signed acceptance of the proposed schedule. When the Division of Simplified Practice has received sufficient signed acceptances, representing at least 80 per cent of the industry by volume of annual production, the recommendation will be printed as part of the "Elimination of Waste" series of the Department of Commerce. The effective date of the program is July 1, 1930.

Wheat Goes Up

Following the sensational May slump of wheat prices to figures below the dollar mark, prices are again on the upgrade. The recent sharp rise of wheat prices is believed by some to have been due to the psychological stimulus of the Federal Farm Board and the rush to cover future needs before the Board could actually begin to function. Such cynicism, however, seems unwarranted in the face of recent weather conditions in the wheat-producing areas of the western hemisphere. Late crop reports are paring down the estimates of the crop, with the result that prices have risen nearly 50c. a bushel since the low figures of May.

Already reports of an unofficial nature indicate that some observers prophesy a world shortage of wheat, although the latest available official forecasts are not quite so bullish. Based on the world's production there seems to be some statistical evidence, however, that supports a prediction of a 25c. increase of prices over the corresponding periods last year. Minneapolis has advanced flour prices to a parity with current wheat prices. Without question there will be several price setbacks due to profit taking by wheat speculators, but it appears that for the coming year flour and wheat prices will be higher.

Deerfoot Farms Sold to National Dairies

National Dairy Products Corporation has purchased the Deerfoot Farms Company, of Boston. Deerfoot does a dairy business of considerable size around Boston but is much better known for its Deerfoot Farms Sausage, which enjoys national distribution.

Many Problems for Solution Seen as Farm Board Begins Operation

Rewarding of Grower of Quality Products May Come in for Early Study—Tariff Taking Shape—Cold-Storage Industry Scores Unfair Practices—Ban Deceptive Spice Containers

By Paul Wooton
Washington Correspondent

THE first meeting of the Federal Farm Board was held in Washington on July 15. Composed of the biggest men available, representative of all important phases of agriculture, the board will attempt to make agriculture more profitable and its activities will be of great interest to practically every manufacturer of foods, for if the particular variety of relief it is able to devise is brought about by raising the prices of farm products raw materials of the food manufacturer will cost him more.

The chairman is Alexander H. Legge, former president of the International Harvester Company, a $100,000-a-year man in private life. Other members of the board are Secretary of Agriculture Hyde, ex-officio; James C. Stone, of Lexington, Ky., vice-chairman, representing tobacco growers; Carl Williams, of Oklahoma City, representing cotton; C. B. Denman, of Farmington, Mo., livestock; Charles C. Teague, of Los Angeles, fruit farming; William F. Schilling, of Northfield, Minn., dairying, and Charles S. Wilson, of Hall, N. Y., miscellaneous agricultural interests. One member remains to be appointed.

From the way the Board has set about its work it is very apparent that the effort to improve the economic position of agriculture is to embrace literally thousands of problems. Apparently there is no thought that the situation can be benefited by drastic, large-scale action. The feeling among the members of the Board seems to be that there is much that can be done, but the benefits promise to come from the improvement of a multitude of practices which separately will not attract much attention but in the aggregate will make it possible to get the business of farming on a profitable basis.

The process is expected to take time and will not be punctuated with striking achievements; in fact, changes in national thinking on some phases of agriculture will have to be brought about. Broad studies must be undertaken in many instances before the Board itself would feel that it had information enough on which to act.

One of the first problems on which study will be started is expected to be that of rewarding the grower of quality products. Under the present system it generally is impossible for the grower of certain higher grade products to realize upon them. The premium paid on wheat, for instance, for its high protein content for its milling qualities does not get back to the producer.

Another question likely to come in for early consideration is the extent to which large-scale operations may be expected to cut costs. There is a widely held belief that in the handling of certain crops large tracts under one management would make a good showing. There still would be plenty of room for the individualists among the farmers, it is argued, as certain other crops lend themselves to that type of operation.

Distribution and marketing will be studied specifically in the hope that economies can be effected in those operations. Elimination of waste is expected to be emphasized. In that connection expansion of the work looking to the control of pests and disease is expected to come in for special attention. Losses due to those causes aggregate $2,000,000,000 annually.

Tariff Approaching Completion

The farmers' final plea for a high tariff on vegetable oils and fats was presented to the Senate Finance Commitee on July 12. It was the fourth time that the spokesmen of the farm organizations have come before the tariff committees of Congress asking for the imposition of a flat ad valorem rate of 45 per cent on all such products, regardless of whether they are now on the free or dutiable list. The House ignored this request, conceding only a few changes in the rates on specified oils.

Objections raised by members of the Senate subcommittee centered on the proposal that the same duty shall be assessed against the products of the Philippine Islands as on imports from other countries.

"It is a very serious question whether it is proper to levy a duty on coconut oil from the Philippines," said Senator Reed, Republican, of Pennsylvania.

"I would like the duty on sugar from the Philippines re-established but I doubt whether it can be done," declared Senator Smoot, Republican, of Utah.

"So long as we have the Philippines they are under the flag," asserted Senator King, Democrat, of Utah.

J. I. Morgan, representing the Interstate Cottonseed Crushers' Association, said that he realized that the proposal of the farm organizations involved this government's policy with respect to the Philippine Islands but he insisted that now is the time that it should be decided one way or the other. There was the suggestion of a compromise in the testimony of J. O. Eastlack, representing the National Co-operative Milk Producers' Federation, Philadelphia. If Congress holds that duties should not be levied against the Philippine Islands, this does not prevent placing duties on the same products from other countries, he said. The testimony revolved around coconut oil for the most part.

In considering the tariff on casein, Senator Smoot stated that the committee would regard the domestic product as equal in quality to the Argentine casein. C. E. Gray, American Dry Milk Institute, San Francisco, had testified that the position taken by domestic consumers that the American product is deficient in quality is not justified by the facts. As the defense prepared by the manufacturers of coated paper was predicated entirely on the argument that domestic casein is not a satisfactory product for use in paper manufacture, Senator Smoot's remark caused considerable dismay.

Walter D. Randall, Champion Coated Paper Company, Hamilton, Ohio, asserted that the committee apparently misunderstood the existing situation. He argued that it is possible to produce a satisfactory casein in this country but that the milk producers evidently are not interested in doing so because the supply is irregular and varies greatly in quality.

If Congress puts an embargo on casein, said H. W. Mattison, Monite Waterproof Glue Company, Minneapolis, then it should see to it that specifications are provided governing its manufacture in this country. In Argentina, he said, the manufacture of casein is a business that is carried on throughtout the year, whereas in this country it is produced in only two months of the year. He explained that the dairy farmers turn their skim milk into casein only when there is no other market for it. Asked by Senator Smoot why his company did not engage in the manufacture of casein, Mr. Mattison said that although skim milk is not worth anything when it is thrown away, it is worth 40c. per 100 lb. when an attempt is made to purchase it from the farmer. Mr. Mattison stated that it is only the dairy farmers adjacent to large cities that are asking for an increased duty on casein.

New Refrigeration Trade Practice

Keeping the cold-storage industry out of the banking business was the principal purpose of a trade practice conference held in Minneapolis, Minn., on July 2 under Federal Trade Commission auspices. With unanimous action, upward of three-fourths of the commercial cold storage warehousers concurred in the adoption of some twenty resolutions banning unfair trade practices.

It has become the practice to loan as high as 100 per cent on produce accepted for storage with the result that companies often are "stuck" with unmarketable goods in case of a sudden

price drop or the insolvency of their clients. To correct this evil, the conference ruled, among other things, against loans greater than 80 per cent of produce value.

UNFAIR PRACTICE IN SPICE TRADE

"The use of deceptively slack-filled or deceptively shaped containers for ground spices is an unfair method of competition." This resolution, adopted by a trade practice conference of the spice grinders and packers last May, has been approved by the Federal Trade Commission as a Group One Rule, enforceable at law. At present the ruling applies specifically to peppers, paprika, ginger, cinnamon, cloves, allspice (pimento), nutmeg, mace, tumeric, mustard, or a mixture of two or more of these, herbs excluded. Adoption as a Group One Rule, however, gives promise of extension into other branches of the foodstuffs industry in the near future.

Slack filling in the spice trade has been brought about by rapid price fluctuations. The retailers desire packages which can be sold at standard prices. Rather than vary container sizes, wholesalers have regulated the contents with market changes. While this may not have been done with intent to deceive, in extreme cases containers have been filled to less than half capacity. Spice packers have found this practice a menace to the best interests of the industry and of the public. The slack-filling rule is defined by a series of minimum tolerance allowances.

Glidden Buys Durkee

E. R. Durkee & Company, New York, for 81 years manufacturer of salad dressings, sauces and condiments, has been sold to the Glidden Company, of Cleveland. Glidden recently entered the food field through the edible oil, margarin and coconut butter route.

Another recent Glidden acquisition is the W. W. Benchley Company, of Oakland, Calif., the business of which is to be consolidated with that of the Glidden plant at Berkeley, Calif.

Canadian Grain Merger

Nine important grain and elevator companies in Canada are reported to be merged into the $9,250,000 Federal Grains, Ltd., with 339 county elevators and 7,250,000 bushels of terminal grain storage capacity. The concerns involved are Stewart Terminals Company, Consolidated Elevator Company, Federal Elevator Company, International Elevator Company, Union Grain Company, Northwestern Elevator Company, McLaughlin Elevator Company, Topper Grain Company, and Brooks Elevator Company.

James Stewart will be chairman of the board; J. C. Gage, president and general manager of the Consolidated Company, will be president; Harry E. Sellers, president of the Northwestern Elevator Company, will be vice-president; A. P. Michael, general manager of the Federal Elevator Company, will be general manager of the new company.

General Food Enters Oyster Business

General Foods Company has acquired the North Atlantic Oyster Farms, Inc., which operates along the shores of Rhode Island, Connecticut and Long Island. It will be operated in conjunction with the General Sea Foods Company of Gloucester, Mass., another recently acquired subsidiary. W. H. Raye, president of the North Atlantic concern, will continue in active charge of the business.

Further Borden Expansion

In a recent letter to stockholders, Arthur W. Milburn, president of the Borden Company, announces the acquisition of 52 corporations engaged in the manufacture and sale of ice cream, cheese, dried milk, butter and milk sugar, and in the distribution of poultry, milk, cream and eggs. All of the purchases were made by the exchange of shares of Borden stock. Cash was used only to retire bonds and preferred stocks.

In addition to the Casein Corporation of America, and a few others, listed in July FOOD INDUSTRIES, the recent acquisitions include:

The Hendler Creamery Company, Inc.; the Supreme Ice Cream Company, the Horn Ice Cream Company and the Clover Ice Cream Company, all of Baltimore and adjacent territory.

The Borgens Dairy Company, Des Plaines Dairy Company, Arlington Heights Dairy Company and Rascher Dairy Company, all milk distributers, and the Central Dairy Products Corporation and subsidiaries, ice cream, operating in Chicago and vicinity.

Averill Dairy Company, Akron, Ohio.

Trojan Ice Cream Corporation, Troy, Glens Falls and Hudson, N. Y.

The Plainfield Milk & Cream Company, Plainfield, N. J.

The Mutual Dairy Association and Peerless Creamery Company of Los Angeles, Calif.

Standard Creameries, Inc., and subsidiaries, operating in Oakland, Sacramento, Stockton, Santa Barbara, Taft, Hayward and Turlock, Cal.

Maricopa Creamery Company, Phoenix, Ariz.

Galloway-West Company, milk, cream, etc., Fond-du-Lac, Wis.

Central Distributers, Inc., and subsidiaries, frozen eggs, New York and Boston.

Amos Bird Company, eggs in shell, frozen eggs and egg powder, which is sold principally in England and Continental Europe, Shanghai, China.

Fox River Butter Company, Inc., New York City.

Hanford Produce Company, Sioux City, Iowa.

Norfolk Poultry Company, Norfolk, Neb.

Mistletoe Creameries, Inc.; Morning Glory Creameries, Inc.; Texas Creamery Cold Storage Company and Western Ice Company, all of Fort Worth, Texas.

Kirschbaum & Sons, Inc., butter, Omaha, Neb.

Willow Springs Creamery Company, Springfield, Mo.

M. Augenblick & Bro., Inc., dairy products, Newark, N. J.

Red Wing Corporation, ice cream, Dayton, Ohio.

Castanea Dairy Company, Trenton, N. J.

Monroe Cheese Company, Van Wert, Ohio.

Hasselbeck Cheese Company, Buffalo, N. Y.

International Vitamin Corporation Formed

Announcement of the formation of the International Vitamin Corporation of New York was made in July. Under the technical direction of Dr. Joseph K. Marcus, formerly assistant professor of chemistry at Columbia University, the new company will manufacture and sell concentrates of vitamins A, D and E. Dr. Marcus describes one of his methods of obtaining a concentrate of vitamin A and D in an article entitled "A New Process for the Separation of the Vitamin Fraction from Cod-Liver Oil," in the *Journal of Biological Chemistry*, vol. 80, 1928, pages 9-13.

Julian M. Gerard, who resigned the presidency of the International Germanic Trust Company to launch the new enterprise, is president. Associated with him is the following directorate: Esmond P. O'Brien, vice-president of the Postal Telegraph Company; Wilson Hatch Tucker, director of Lord & Taylor; George W. Carpenter, of Jesup & Lamont, bankers and brokers; Colonel C. H. Huston, chairman of the Transcontinental Oil Company; A. J. Kobler, president of the *Daily Mirror;* Charles D. Newton, former Attorney General of New York; Daniel O. Hastings, of Wilmington, Del.; and Dr. Simon Lubarsky, president of Regal Drug Company.

The company's capital structure will involve 200,000 shares of no par value and no bonds or preferred stock. A plant in Long Island City for the preparation of its vitamin A and D is now being equipped, and by September it is expected that it will be in production of vitamin concentrates of standardized potency. Where food manufacturers will require unusually large quantities of vitamins it is planned to license them to manufacture their own requirements under patents held by the International company. At a later date the commercial production of vitamin E will be undertaken.

General Foods Acquires Diamond Crystal Salt

Sale of the Diamond Crystal Salt Company, of St. Claire, Mich., to General Foods, Inc., announced recently, gives the former Postum Company control of 20 food product organizations. The Salt Company with its 12 wells along the Detroit and St. Claire rivers has a daily capacity of 4,500 barrels.

Corn Canning Merger Announced in Iowa

The formation of the Iowa Canning Company, with assets that will exceed $1,000,000, was announced in July. The new company will have seven plants, two of which are at Vinton, Iowa, with the others at Laporte City, Garrison, Shellsburg, Sac City and Storm Lake.

Dairy Science Association Meeting Well Attended by the Industry

THE annual meeting of the American Dairy Science Association at Washington, D. C., on June 26-28 was signalized by the attendance of a larger number than usual from the industry among the two hundred and fifty-two registrants. Some well-known firms were not represented, but it is pleasing to observe that the larger milk products companies appreciate the value of keeping in close touch with those in the universities and experiment stations who are doing research work.

After the general session sectional meetings were held representing: (1) Dairy manufactures, bacteriology and market milk; (2) official testing; (3) dairy production; (4) dairy extension. Steps were taken toward the formation of a section of dairy economics. A resolution opposing the new "standard milk ordinance" of the Bureau of Hygiene aroused much discussion. Eventually it was tabled pending the distribution to the members of reports concerning it from the Bureau of Hygiene and the American Dairy Federation.

Roy C. Potts, of the Bureau of Economics, U. S. Department of Agriculture, reviewed the progress of the industry in the last twenty years. Dairying is now "big business," having reached the stage of hundred million dollar corporations. The modern tendency is toward an increase in the number of plants capable of making a variety of products according to the market demand. One such plant, a cooperative in Washington, makes sixteen products with unusual financial success.

Copper Equipment Passing

The disappearance of copper and copper-alloy equipment from dairy plants within ten years was prophesied by E. S. Guthrie and C. L. Roadhouse, owing to the flavor that the copper imparts to milk. They found Allegheny metal, aluminum, glass enamel, nickel, chromium plate and good tinplate the most satisfactory of materials studied from the viewpoint of taste.

Recently much discussion has arisen over the percentage of lipoids estimated as butterfat by the Roese-Gottlieb and Babcock methods, especially with respect to fat losses in buttermilk. L. M. Thurston outlined a method of estimation in which the Roese-Gottlieb fat residue is extracted with acetone. Fat is soluble in acetone but lipoids are not. Up to 25 per cent of the Roese-Gottlieb "fat" in buttermilk may be lipoids.

Frank E. Rice made a plea for the revision of the Babcock test to bring it into line with the Roese-Gottlieb test. Evaporated milk manufacturers buy by the former and sell by the latter. The difference amounts to 0.03 to 0.10 per cent fat, equivalent to a sum of possibly over a million dollars a year.

J. L. Sammis and Leo Germain showed that a rich cheese was liable to be a poor cheese. Most cheese makers keep their moisture content up to the state limit, so that this factor is constant. Then increasing the fat content (by using richer milk) automatically decreases the content of non-fat solids and likewise the ratio of non-fat solids to moisture. Cheeses of constant moisture content with a high fat content were definitely poorer in quality than those in which fat formed the legal 50 per cent of the dry matter. To obtain a quality with 5 per cent milk equal to 3 per cent either the milk must be standardized down or the cheese must be made with less moisture.

In discussing process cheese H. L. Templeton and H. H. Sommer found that sodium citrate, as an emulsifying agent, gave better body than di-sodium phosphate. The latter also darkened the tinfoil wrapper. However, citrate cheese was attacked by mites, whereas phosphate cheese was not. Sodium-potassium tartrate also is used as an emulsifier but is likely to contain gritty insoluble particles of calcium tartrate.

M. J. Prucha found no advantage in the use of Janus green over methylene blue for the reductase test. It requires a longer time for the color reduction. R. W. Bell noted that heating skim milk to 180 deg. or 190 deg. for cultured buttermilk gave a greater viscosity in the product than 170 deg. F. heating.

Make New Variety of Ice Cream

Honey, as a substitute, in whole or in part, for sugar affords a new variety of ice cream, it was reported by P. H. Tracy, who made sixteen varieties containing honey. In a few cases the combinations did not meet with cordial welcome, but with most varieties a preference was for honey ice cream on the score of flavor and texture. The preferred composition is 13.5 per cent honey with 3.5 per cent sugar. Less than 9 per cent honey is not recommended in any case; and if honey is to replace sugar altogether 16 to 18 per cent is required—that is, about 25 per cent more by weight than the sugar replaced. The combination of vanilla with honey gave a very bad effect, but combination with chocolate and all fruit flavors proved satisfactory. Substitution of honey costs approximately nothing extra because it replaces both sugar and vanilla.

A comprehensive study on a small scale of the use of frozen fruits in ice cream was made by H. J. Mack and his associates. The fruits used were frozen with and without sugar at 0 to —5 deg. F. and stored at 15 deg. F. For use the fruit was melted, crushed, and utilized in an ice cream mix carrying 14 per cent fat and 15 per cent sugar. Preliminary tests have been checked by 40-quart freezer semi-commercial trials.

It was very clearly demonstrated that fruit frozen without sugar does not preserve satisfactorily under the conditions of these investigations. It was shown also that the use of corn sugar produced objectionable color change and some other undesired variations in behavior of the fruits. These objectionable results seemed to be due in part to traces of sulphur dioxide found in the corn sugar, but this point was not proved. Best conditions for freezing and storage were 2 to 3 parts of fruit per 1 part of sugar for strawberries and raspberries, 2 to 1 for cherries, and 3 or 4 to 1 for peaches. If frozen fruit has shriveled, due to improper handling, the results in the ice cream were bad.

Dried skim milk is very largely replacing liquid milk in ice cream making, according to O. E. Williams and S. E. Hall, who have investigated its effect on texture and flavor. The full economic possibilities obtainable have not yet been realized by the industry. Spray-dried milk is better than drum-dried, but some common brands are very much more satisfactory than others. One brand was consistently the preferred constituent in all of their investigations, both as compared with other dried milks and as compared with liquid milk for ice creams. Ice cream manufacturers who have not tried good-quality spray-dried skim milk should do so. Spray-dried milk, forewarmed to 180 deg. F. before drying, gave a better texture and flavor to ice cream than 145 deg. forewarming or roller-dried milk.

The effect of aging ice cream mixes, reported by J. C. Hening, included observations on cream made under identical conditions in 1-gallon experimental freezers from mixes which had aged 2, 4, and 20 hours. In all cases they were homogenized and pasteurized, cooled to 40 deg. F. and then frozen after the indicated intervals of aging.

The time of aging does not materially affect the whipping properties of the mixes or the over-run obtained. However, the aged mixes whipped more quickly in some cases.

The relationship of the quantity and quality of gelatin to the viscosity and the plasticity of ice cream mixes has been investigated by Alan Leighton and Floyd E. Kurtz. A rough relationship exists between the viscosity and the quantity and properties of the gelatin used. It is very evident that more of a cheap gelatin gives approximately the same plastic effect as a smaller quantity of a better grade. They suggest the possibility of saving on gelatin cost by utilizing that grade of gelatin which gives the lowest total cost of this constituent, other factors remaining unaffected.

United Biscuit Acquisition

United Biscuit Company of America has acquired Keebler-Weyl Baking Company of Philadelphia in exchange for 24,416 shares of United Biscuit common.

Discuss Preservation Of Food at Meeting of Refrigerating Engineers

THE spring meeting of the American Society of Refrigerating Engineers was held from June 20 to 22 at the Pennsylvania State College, State College, Pa. The program of papers for the technical sessions, while dealing largely with problems of refrigerating engineering, physical measurements, and problems of domestic refrigeration, also held several papers that were of general interest to all who are interested in food preservation and transportation of perishable foods.

An interesting discussion on the subject of "Current Practice of Transit Refrigeration," by E. F. McPike, manager of perishable freight service of the Illinois Central R.R., brought out the facts that 30 per cent of the total claims against railroads were for damage to perishables, and that the total sums so paid out amounted to $10,700,000 annually, based on recent figures. If refrigerator cars could be so designed that the temperatures could be kept lower or that a given temperature could be maintained for a longer period of time with a given quantity of ice a very definite decrease in the claims for damage to perishables could be predicted.

The desired increase of efficiency, however, can be attained only by better or greater insulation, and increased insulation entails an increased weight per car, which, of course, will occasion an increase in the cost of hauling the car around the country. Since there are approximately 190,000 refrigerator cars in the United States and since the average cost of hauling per ton mile is known it is a matter of fairly simple calculation to determine how many pounds of extra insulation per car would produce a hauling charge equal to the damage claims on perishables. Mr. McPike estimates that with a $10,700,000 saving as a possibility, against which would be charged the hauling cost, the maximum amount of increase of insulation would amount to but 500 lb. per car.

Much Depends on Car Handling

This amount of insulation, however, is not sufficient to guarantee that the increased protection will prevent damage claims and therefore any cut in the amount of claims probably will be the result of more efficient handling of cars and trains and a better understanding on the part of the carrier and the shipper of the true function of a refrigerator car. It is impossible to make a storage house out of a refrigerator car, which is at best a protective device, and, with a full realization of the practical limitations of refrigerator service on the part of all concerned, the protection it affords can be utilized to the greatest advantage.

"Governing Factors in Transportation of Perishable Commodities," by L. A. Hawkins, principal physiologist, Bureau of Plant Industry, U. S. Department of Agriculture, was an excellent discussion of the characteristics of the perishable product itself and the conditions they impose upon refrigeration in transit. He pointed out that the best conditions for the transportation of foodstuffs are similar to those for the holding of foodstuffs for the longest possible time in good condition, and that the optimum temperature for keeping a commodity is not necessarily the lowest temperature at which it may be kept without freezing. Many perishables will experience damage at temperatures considerably above the freezing point.

The advantages of precooling the commodity before shipping were stressed, for it is much more economically done in precooling plants than by attempting to coal it in iced refrigerator cars in transit. Fruits and vegetables present an additional problem, for they are living things and as such give off definite quantities of vital heat due to their processes of life. The rate of formation of vital heat depends on the temperature of storage and hence more ice will be melted in maintaining a higher temperature of storage than would be melted in maintaining a lower temperature.

That 50° F. Danger (?) Mark

Another discussion of great interest to the members of the society as well as to readers of Food Industries was some very incisive comment by Dr. E. F. Mueller, physicist of the Bureau of Standards, Washington, D. C. Among other remarks he referred to the food preservation program of the National Food Preservation Council, which is to be widely advertised in September and will attempt to impress the four major ideas upon the minds of the public: (1) The causes of food decay and bacterial growth; (2) the relationship between food spoilage and health; (3) the vital need for proper all-year refrigeration; (4) to establish in the public mind a perishable food temperature of 50 deg. F. or less.

His discussion was upon the figure of 50 deg. F. as the danger mark and he raised a question as to how 50 deg. F. came to be selected as the figure to be emphasized to the public. He feared that the existing plans might overstress the figure 50 to the extent that the lay public would expect that it was a critical temperature rather than one which would give reasonably satisfactory preservation of perishable foods.

The points which he raised were quite spiritedly discussed, and it is probable that his talk stirred up more arguments than any other on the program of the convention. He feared that by overemphasis of a definite arbitrary figure the manufacturers of both mechanical and iced refrigerators might be creating a situation for themselves that would be the cause of certain regrets should any of the equipment fail to maintain the specified maximum temperature.

Vegetable Dehydrating Plants In Combine

Vegetized Foods, Inc., has been organized to take over the assets and business of the California Vegetable Products Company and the Vegetable Products Corporation. The new company will have offices in Los Angeles. Steps are being taken by the new company to enlarge its present dehydrating plant in Burbank, Calif., and to build an additional plant in Orange County, Calif. Twenty-four biscuit manufacturers are now licensed to use the company's products in the manufacture of vegetized wafers.

John Bean Manufacturing Co. Changes Name

During the past year the business of the John Bean Manufacturing Company has expanded from resources of less than $2,000,000 to more than $7,000,000. Its activities have extended into such new fields of industry as canning machinery in all of its branches; machinery for preparing, packing and shipping citrus fruits and perishable fruits and vegetables, and the development of automotive maintenance accessories. Its major acquisitions have been by consolidation or purchase of the businesses of Anderson-Barngrover Manufacturing Company, Sprague-Sells Corporation and Stebler-Parker Company.

Canadian Butter Arrives

Twenty-pound tubs of butter sent from 175 creameries in 21 states and the Canadian provinces of Saskatchewan and Alberta were received in St. Louis June 20 for entry in the tenth annual storage butter contest sponsored by the National Dairy Association in connection with the National Dairy Exposition to be held there in October. The butter was marked for flavor, body, color, salting, and packaging. It is to be stored at a temperature of from zero to 5 deg. below zero until the time of the exposition, when it will be withdrawn and judged again to determine whether it has deteriorated or improved in flavor.

Judges are L. S. Edwards, Nashville, Tenn., dairy manufacturing specialist; H. C. Larson, Madison, Wis., secretary of the Wisconsin Butter Makers Association, and H. D. Reynolds, of Mason City, Iowa. S. H. Anderson, executive secretary of the National Dairy Association, is in charge of the contest.

Standard Brands, Inc.

Standard Brands, Inc., is the name of the new company resulting from the consolidation of the Fleischmann Company, the Royal Baking Powder Company and the E. W. Gillett Company, Ltd. The merging units will, for the present, retain their individuality and Standard Brands, Inc., will be the holding company.

Beverage Industry Formulates a Sanitary Code

THE American Bottlers of Carbonated Beverages have formulated a sanitary code designed "not merely to enable the manufacturer of carbonated beverages to produce a clean product in conformity with state and local regulations, but also to improve the quality and keeping properties of carbonated beverages and to create a sense of cleanliness and sanitation in bottling plants, so that they may, at all times, be exhibited and pointed to with pride." Those desirous of taking similar action may procure from the A.B.C.B. headquarters, Bond Building, Washington, D. C., the full text of the code, with its explanatory "Reasons for Requirements" and "Satisfactory Compliance." The basic code follows:

BUILDINGS AND PREMISES

1. The building or portion thereof employed for the manufacture of bottled beverages shall be used for no other purpose and shall be so located as to be protected from objectionable surroundings.

2. The floors of all rooms shall be of concrete, tile, or other material with a smooth surface and maintained in a clean and sanitary condition. Preferably they should be graded and sloped to properly trapped drains.

3. Walls and ceilings in the sirup and bottling rooms shall be of hard, sound materials with smooth, easily cleaned surfaces, frequently painted and maintained clean.

4. All rooms shall be adequately lighted and ventilated.

5. All openings to the outer air shall be screened or otherwise protected where necessary against entrance of flies.

6. The sirup room shall be separately inclosed, well ventilated and lighted, provided with sinks and taps for hot and cold water, thoroughly protected against vermin, flies, dirt, and dust, and so constructed as to be particularly easily cleaned.

7. Running water shall be easily accessible to all parts of the plant and adequate provision for quickly carrying off and disposing of waste water shall be provided.

8. Suitable toilets, preferably which have no direct connection with the rooms employed for manufacturing, and adequate lavatory facilities shall be provided and maintained in a clean and sanitary condition.

MACHINERY AND EQUIPMENT

9. Every plant manufacturing bottled beverages shall be equipped with suitable mechanical bottle-washing apparatus and with approved machines for carbonating, filling, and crowning, so that these operations are performed in such manner as to prevent any part of the operator or his clothing from coming in contact with those surfaces of the bottle which come in contact with the beverage.

10. Conveyors and cases shall be maintained in a clean and sanitary condition.

11. All vats, jars, mixing and storage tanks, pipe lines, filters, and other apparatus employed in the preparation of sirups shall be of sanitary construction and lined with materials resistant to the action of sirup ingredients.

12. Electrical or chemical coagulation devices and filters employed for clarification of water shall be of types approved by the local health authorities, shall not be operated beyond their rated capacity, and shall be maintained in a clean, wholesome, and sanitary condition at all times.

13. Every plant manufacturing bottled beverages shall be adequately provided with thermometers, acid and sugar hydrometers, gas volume testers, and apparatus for ascertaining the alkalinity of the soaker solution employed in bottle washing.

MANUFACTURING METHODS AND OPERATIONS

14. Where practicable, the operations of bottle washing and filling, compounding and mixing of sirups, and shipping, should be performed in separate rooms. Where this is not feasible, the various operations should be located in the available space in such manner as not to interfere with one another.

15. Hand bottle washing, except as a preliminary to subsequent mechanical washing, shall be prohibited. All bottles shall be thoroughly cleaned and sterilized, immediately before filling, by means of a suitable automatic mechanical washing machine.

16. Sirups shall be prepared in a clean manner, and every precaution shall be taken against contamination, or absorption of deleterious substances, during the process of preparation and subsequent storage.

17. Manual filling or crowning shall be prohibited. Bottles shall be filled and capped with automatic machinery and the operator or his clothes shall not come in contact with any portion of the bottle or machinery which might result in contamination of the product.

18. Crowns shall be stored in dust-proof containers.

19. All non-alcoholic colors shall be prepared in small batches, sterilized immediately before use, and stored so as to be protected against dust.

20. The finished products shall be stored in such manner as not to interfere with the sanitation of the bottling room.

21. Broken bottles and such other refuse and rubbish as may be found in returned cases, and the like, shall be placed in suitable containers and properly disposed of.

22. All pipe lines, apparatus and containers employed in the manufacturing processes shall be thoroughly washed, cleaned, and sterilized at frequent intervals so as to be maintained at all times in a clean and sanitary condition. Steam, hot water, chlorine or other equally efficient agents are permissible for sterilization.

INGREDIENTS

23. The water employed in the manufacture of beverages and for rinsing bottles, or other containers, shall be free from substances deleterious to health and shall conform to the U. S. Treasury Department standards for potable water.

24. The sweetening agents employed in the manufacture of bottled beverages shall consist exclusively of clean, pure cane or beet sugar or other suitable and nutritious carbohydrates.

25. No antiseptic, disinfectant, or preservative prohibited by food and drug or health laws shall be employed in beverages.

26. Citric, tartaric, or other edible organic acids, and their salts may be employed; mineral acids other than phosphoric acid or its salts shall be prohibited from carbonated beverages. Acids and flavors shall be stored in suitable containers, properly labeled, and protected against contamination.

27. Only natural vegetable colors, caramel, or harmless coal-tar colors certified by the U. S. Department of Agriculture shall be employed.

PERSONNEL

28. All persons engaged in the mixing of sirups, filling of bottles, or in any other capacity which brings them in contact with the ingredients or containers of beverages shall be free from communicable disease or insanitary habits, and shall be of clean, neat appearance and wear clean clothes.

Carbonated Beverage Makers To Issue Pamphlet

The American Bottlers of Carbonated Beverages has made an extensive survey of the literature in order to prepare a "List of References to Authoritative Writings on the Carbonated Beverage Industry." The issue of this new pamphlet is intended, according to Secretary Owens' office, to facilitate reference by members to precise and comprehensive information on all phases of the business. This reference list is in effect a part of the educational bulletin series of the association. The summary includes important articles of interest outside the beverage business on sanitation, food regulations, water supply, flavors, fruit acids, and food colors.

Cannery for Kamchatka

A large canning plant is being built by the AKO, the Kamchatka joint-stock company, in the Kitchik-Kolsk district of Kamchatka. The plant will produce 45,000 cases of canned salmon and 9,000 cases of crab meat per year with American equipment.

To Study Fruit Shipments Aboard Vessels

The agricultural experiment station of the University of California is planning extensive investigations this summer on perishable fruits and vegetables under refrigeration on board ships en route to foreign ports. As outlined by Prof. E. L. Overholser, of the department of pomology and director of the project, the studies will include: the temperature of the fruit and storage compartments; relative humidity changes in storage compartments and their effects on the fruit; the carbon dioxide and oxygen contents of the storage compartments; the fruit containers and the intercellular spaces of the fruit itself, as affected by the frequency of ventilation, storms at sea, etc.; the development of physiological troubles and diseases which may arise in the fruit; the condition of the fruit when it arrives at the market in the Orient or elsewhere; and the marketing and handling conditions for fruit at the various ports.

The investigations will be carried out in laboratories on board fruit-carrying steamers equipped with the necessary control and recording instruments.

Pie Company Merger

Formation of the Case-Moody Pie Company, which will have properties valued at $6,000,000 and 150 motorized pie routes in surrounding territory within 100 miles, was announced in Chicago on July 11. The concerns involved are the Case & Martin Company, the Moody & Waters Company, the Patterson Pure Food Pie Company and the Pellar Pie Company. The present volume of business of the four companies is 26,000,000 pies annually.

Elmer Case will be president of the new company; Charles H. Moody and Joseph Pellar, vice-presidents; Stanley Case, treasurer; and Robert D. Stevenson, secretary. Ames, Emerich & Company, financial house, which arranged the merger, are represented on the directorate by Charles A. Pipenhagen and Robert Irhnstron.

Bakeries for Soviet Russia

Twenty-six bread baking plants, with a total annual production capacity of 2,000,000 tons, are at present under construction in various cities of the Soviet Union. Up to Jan. 1, 1929, 40 baking plants, located at Moscow, Leningrad, Rostov-on-Don, Ivanovo-Voznesensk, Tula, Nizhni-Novgorod, Artemovsk and other industrial centers of the U. S. S. R. were completed, most of them in the past two years. Before the war practically no modern baking plants existed in Russia. The construction of a number of additional baking plants, to be built in accordance with the most modern practice in regard to design and machinery, is also on the program.

Reid, Murdoch & Company Buys Oregon Plant

Reid, Murdoch & Company have purchased the property of the former King Food Products Company, of Salem, Ore. The new owners will not operate the plant this season but are getting it in shape to operate in 1930. R. A. Yocom, formerly superintendent of the Eugene Fruit Growers' Association, of Eugene, Ore., is the manager of the new plant.

PERSONAL

JOSEPH F. ABBOTT, general counsel for the American Sugar Refining Company since 1919, has been elected president of the company.

DR. CARL ALSBERG, contributing editor to FOOD INDUSTRIES and one of the directors of the Food Research Institute of Stanford University, sailed June 25 for Batavia, Java, where he will spend about a month and then proceed to Singapore and Peking for short visits. Following this he plans to go to the Philippines. In October he will attend the conference in Kyoto, Japan, of the Institute of Pacific Relations, of which he is a member of the American group. He will return to San Francisco about Dec. 3. He plans to investigate and study tropical agricultural products and methods, and colonial policies relating to agricultural matters, especially land policies. Dr. Alsberg is directing two projects of the Institute of Pacific Relations. These are: "The Trend of Agricultural Consumption of Products in Eastern Asia" and "The Trend of Pacific Agriculture from Subsistence to Cash Crop Farming."

LAIRD BELL, of Fisher, Boyden, Kales and Bell, Chicago attorneys, has been elected a director of Liquid Carbonic Company.

W. EDWARD FOSTER, who until recently was president of the American Sugar Refining Company, has been elected vice-chairman of the board of directors.

C. J. HOOPER, formerly general manager of the Western Meat Company, of San Francisco, is now president and general manager of the Metzger Packing Company, which is building a new plant at South San Francisco.

FRANK HUTCHINSON, president of the Hutchinson Ice Cream Company, of Cedar Rapids, Iowa, was awarded a Certificate of Eminent Service in Agriculture by the Iowa State College of Agriculture at its June commencement. He was recommended for this honor because he was the first one to establish the wholesale ice cream business in Iowa.

PETER JENKINS has been appointed general manager of the Yonkers (N. Y.) plant of the Spreckels Sugar Corporation to succeed the late Louis Spreckels. Mr. Jenkins joined the company in 1902 as inspector of construction. T. H. MURPHY will be superintendent of production and N. J. EBBITT will be superintendent in charge of distribution.

DR. C. W. LARSON, director of the National Dairy Council, has resigned to enter a new commercial dairy enterprise in New York which is still in the formative stage. Doctor Larson was Chief of the Bureau of Dairy Industry prior to 1927.

C. P. LATHROP has resigned as technical adviser to the National Preservers' Association and after Aug. 1 will be with Curtice Brothers Company, of Rochester, N. Y. He will have charge of laboratories and manufacturing operations.

GENERAL HERBERT M. LORD, until recently Director of the U. S. Bureau of the Budget, is associated with Arthur S. Kleeman, New York investment banker, and Dr. C. W. Larson in a new dairy enterprise. Detailed information relative to the business has not been made public.

WILLIAM F. ROBERTSON has resigned as factory manager and chemist for the Za-Rex Company, Inc., to enter the research department of the Pfaudler Company at Rochester, N. Y., in the food products division.

ARTHUR H. ROSENFELD, consulting sugar technologist of the American Sugar Cane League, was elected secretary to the International Society of Cane Sugar Technologists at its third triennial session in Sourabaya, Java. The next meeting of the society will be in Porto Rico in 1932.

HARRY C. STINER, of the National Biscuit Company, sailed for Turkey on July 24 to supervise the fumigation of the dried fig crop at the plant at Reshadich, near Smyrna.

C. D. TRUBENBACH, treasurer of the Max Ams Machine Company, of New York, sailed for Europe on July 10 and plans to visit every important canning center in England, France, Germany, Belgium and Holland.

OBITUARY

JOHN ACKERMAN, 52 years old, chief engineer of the Spreckels Sugar Refining Company in Yonkers, N. Y., died at his home in that city on July 8. He had been with the Spreckels company for more than 20 years.

ARTHUR H. FREEMAN, vice-president of the Griffith Laboratories, of Chicago, died on July 3 of heart disease in Boston. He was one of the incorporators of the Griffith enterprise, which is best known for its liquid spice products.

MALCOLM K. GRANT, 38, president and treasurer of Wagars, Inc., Troy, N. Y., ice cream manufacturers, died by drowning on June 9.

JAMES N. JARVIE, of Montclair, N. J., died at sea on the "Homeric" en route to England on June 21 at the age of 75. He was born in Manchester, England, and came to America in 1859. After he entered business life he became associated with Arbuckle Brothers, manufacturers and dealers in coffee and sugar, later becoming a partner in the concern. At the time he withdrew from active business in 1906 he was known as the "Coffee King." He was a director of Continental Baking Company and Cuba Cane Sugar Corporation in addition to other non-food corporations.

ARTHUR L. KYLE, 53, superintendent in charge of the operations of all canneries of the California Packing Corporation, died June 24 at Santa Barbara, Calif. Mr. Kyle was formerly general superintendent of the Central California Cannery and became assistant superintendent of the California Packing Corporation when it was formed in 1906.

GEORGE R. ROBINSON, one of the founders of the Ralston-Purina Company, died June 29 on a train bound from Colorado Springs, Colo., to St. Louis. He was 63 years old and had suffered from heart trouble for about a year. He retired from business about 15 years ago. At the age of 18, Mr. Robinson was employed by the Clark & Stuyvesant Grocery Company, with which he remained two years. For the following two years he worked for Meyer's Feed Mill. In 1888 he became vice-president of the Andrews & Robinson Forage Company and five years afterward joined William H. Danforth in the formation of the Ralston-Danforth Commission Company. The concern became the Ralston-Purina Company 25 years ago, and now does a nation-wide business and has assets of $21,000,000. Mr. Robinson is survived by his wife, three sons and a daughter.

LOUIS SPRECKELS, for many years general manager of the Spreckels Sugar Refining Company in Yonkers, N. Y., died on June 28 of a heart attack at his home. He was 62 years old and a native of California. He was a nephew of Claus Spreckels, well known in the Pacific Coast sugar business and a cousin of Rudolf Spreckels, president of the Spreckels Sugar Corporation, recently formed to take over the Federal Sugar Refining Company. Mr. Spreckels went into his uncle's business when he was 16 years old and worked his way up through the Western Sugar Refining Company in San Francisco. Later he was made an official of the Spreckels Refining Company's Philadelphia plant. About 1906 he became general superintendent of the Yonkers plant and later general manager.

DR. ERNST TWITCHELL died in Cincinnati on June 6. His connection with the Emery Candle Company is overshadowed by his international prominence as a scientist and an authority on oils and fats. In 1917 he was awarded the Perkin Medal of the Society of Chemical Industry for "Original and Valuable Work in Applied Chemistry." He probably is best known for his discovery of the "Twitchell process" for the splitting of fatty acids and glycerine from fats. He was 66 years old.

WALTER WILLIAMS, 53, of the preserve department of Squire Dingee Company, of Chicago, died June 9 at Nashville, Tenn., after a lingering illness. In his earlier days he was with the old Williams Brothers Company, pickle and preserve house, of Detroit, whose salting stations are now owned by Libby, McNeill & Libby. In 1912 he organized the William Rohtect Company; later joined the Gohl Preserving & Pickling Company, which was acquired by Squire Dingee a few years ago.

HERMAN WUNSCH, 41, vice-president of the Little Rock Packing Company, of Little Rock, Ark., died at his home on June 19. Mr. Wunsch, a native of Wurtemberg, came to America in 1912.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—Cushman's Sons, Inc., 1138 Bryn Mawr Ave., Chicago, Ill., awarded contract for the construction of a 3 story bakery at 4430 North Clark St. to O. W. Rosenthal Cornell Co., 228 North La Salle St., Chicago. Estimated cost $250,000.

Bakery—Ebinger Baking Co., Bedford Ave. and Albemarle Rd., Brooklyn, N. Y., awarded contract for the construction of a bakery at Snyder and Bedford Aves. to J. H. Uhdal, 1357 Rogers Ave., Brooklyn. Estimated cost $100,000.

Bakery—Economy Grocery Co., M. Joseloff, Dist. Mgr., East Hartford (br. Hartford), Conn., is having plans prepared for a 3 story, 70 x 200 ft. bakery on Oakland Ave. Estimated cost $175,000. Monks & Johnson, 99 Chauncy St., Boston, Mass., are architects and engineers. Conveying equipment will be required.

Bakery—First National Stores, Inc., 5 Middlesex Ave., Somerville, Mass., is having plans prepared for the construction of a 3 story, 75 x 200 ft. bakery. Monks & Johnson, 99 Chauncy St., Boston, are architects.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., awarded contract for a 135 x 158 ft. plant at Indiana Ave. and Canal St., Indianapolis, Ind., to W. S. Bellows Construction Co., Hersk Bldg., Oklahoma City, Okla., $200,000; also let contract for addition to plant at 415 Buckingham Ave., Columbus, O., to Boyajohn & Barr, 255 South Park St., Columbus, $125,000; taking bids for a plant at Allentown, Pa., C. B. Comstock, 122 East 42nd St., New York, N. Y., is architect.

Bakery—Mrs. Maurer's Bakery, J. D. Lyles, Mgr., Shreveport, La., is having preliminary plans prepared for the construction of a 3 story bakery on Southern Ave. Estimated cost $150,000.

Bakery—Miner Pie Co., 645 First St. N. W., Grand Rapids, Mich., will soon award contract for the construction of a 1 story, 90 x 110 ft. bakery on Butterworth St. Estimated cost $50,000. F. P. Allen & Sons, Hauseman Bldg., Grand Rapids, are architects.

Bakery—National Baking Co., Ltd., Hull, Que., plans the construction of a bakery at Quebec City, Que. Estimated cost $25,000.

Bakery — New Homestead Bakery, A. Ray, Prop., 532 Austin Ave., Port Arthur, Tex., reported receiving bids for a 1 story, 46 x 100 ft. bakery. Estimated cost $20,000. Livesay & Wiedeman, San Jacinta Life Bldg., Beaumont, are architects.

Bakery—St. Louis Bread Co., 1201-06 North Kingshighway, St. Louis, Mo., awarded contract for the construction of a 2 story, 50 x 90 ft. bakery at North Kingshighway to Bond Finance & Construction Co., 411 Louderman Bldg., St. Louis. Estimated cost $60,000.

Bakery—H. Wasson, Kansas City, Mo., plans the construction of a 135 x 165 ft. bakery at 4th and Lyerly Sts., Chattanooga, Tenn. Estimated cost $200,000.

Bakery—State of California, G. B. McDougall, Public Works Bldg., Sacramento, Calif., Archt., will soon award contract for the construction of a kitchen and bakery building at Patton State Hospital, Patton, Calif. Estimated cost including equipment $150,000.

Bakery and Warehouse—National Tea Co., O. H. Lardin, V. Pres., 2837 3rd Ave. S., Minneapolis, Minn., will soon award contract for the construction of a 3 story bakery and warehouse at 29th St. and Clinton Ave. Estimated cost $400,000. O. N. Newstrom, 804 Metropolitan Life Bldg., Minneapolis, is architect.

Bottling Plant—Sparkletts Bottled Water Corp., 4500 York Blvd., Los Angeles, Calif., will build a 1 story, 125 x 610 ft. bottling plant. Estimated cost $100,000. R. D. King, 1124 Van Nuys Bldg., Los Angeles, is architect. Work will be done under the supervision of C. F. Arisman, 2838 Oregon St., Los Angeles.

Ginger Ale Factory—Canada Dry Ginger Ale, Ltd., 153 Shelbourne St., Toronto, Ont., plans the construction of a plant at Montreal, Que. Estimated cost $175,000.

Canning Plant—F. Furkhart & Associates, Tarpon Springs, Fla., plan the construction of a canning plant at Disston and Lemon Sts. Estimated cost $60,000.

Canning Plant (Kraut and Pickle)—Farmers Canning Association, c/o W. S. Winston, Robstown, Tex., will build a kraut and pickle canning plant. Private plans. Work will probably be done by day labor.

Canning Plant (Citrus Fruit)—Ewell Canning Co., Louisville, Ky., plans the construction of a citrus and vegetable canning plant at Natalia, Tex. Estimated cost $35,000. Private plans. Machinery and equipment will be required.

Canning and Packing Plant — Texas Citrus Fruit Growers Exchange, J. Shary, Pres., Mission, Tex., awarded contract for the construction of a vegetable and citrus fruit canning and packing plant at La Feria, to J. E. Walsh, Mission. Estimated cost $70,000. Private plans. Some machinery and equipment will be required. Contract let for packing machine.

Canning and Packing Plant—East Coast Preserving Co., S. C. Archibald, Pres., P. O. Box 128, Jacksonville, Fla., reported, receiving bids for a 40 x 112 ft. addition to canning and packing plant. Estimated cost $75,000. Grapefruit canning equipment will be required.

Preserving Plant—Florida East Coast Preserving Co., South Jacksonville, Fla., plans the construction of a 15 x 75 ft. warehouse in connection with preserving plant, San Jose Blvd.

Creamery—Dairymen's Protective Assn., 4410 District Blvd., Los Angeles, Calif., awarded contract for the construction of a 1 story, 90 x 122 ft. creamery at Gamercy Pl. to Austin Co., 16112 Euclid Ave., Cleveland, O. Estimated cost $75,000.

Creamery—Edwardsville Creamery Co., Edwardsville, Ill., awarded contract for a 2 story, 50 x 100 ft. addition to creamery to A. J. Hoffman, 203 Springer St., Edwardsville. Estimated cost $40,000.

Creamery—Fairmont Creamery Co., C. L. Dilts, Local Mgr., 608 Bolivar Rd., Cleveland, O., is having preliminary plans prepared for the

construction of a 6 story creamery at West 17th St. and Willey Ave. Estimated cost $600,000. F. V. Thomas, c/o owner, Omaha, Neb., is architect.

Creamery—Sugar Creek Creamery Co., H. C. Horneman, Pres., Danville, Ill., reported, acquired Golden Grain Butter Co. and plans the construction of a creamery at Cape Girardeau, Mo. Estimated cost $100,000.

Creamery—Thorpe Dairy Co., Thorpe, Wis., c/o Kampfer & Buetow, 1380 Blair St., St. Paul, Minn., Archts., will soon award contract for the construction of a 2 story creamery at Thorpe. Estimated cost $35,000.

Creamery and Dairy Plant—Southwest Dairy Products Co., c/o E. T. Laubsher, V. Pres., 300 Jones Ave., San Antonio, Tex., will soon award contract for a 2 story, 100 x 100 ft. creamery and dairy plant. Adams & Adams, Real Estate Bldg., San Antonio, are architects. Matthews & Kenan, Smith Young Tower, San Antonio, are engineers. Machinery and equipment will be required.

Cheese Factory — Kraft-Phoenix Cheese Co., c/o Chamber of Commerce, West Jefferson, N. C., plans the construction of a cheese factory. $100,000.

Animal Husbandry and Dairy Building—Alabama Polytechnic Institute, Auburn, Ala., will soon award contract for the construction of a 3 story animal husbandry and dairy building. Warren, Knight & Davis, Protective Life Bldg., Birmingham, are architects.

Dairy and Creamery—W. H. Roberts, Millersville Park, Indianapolis, Ind., is receiving bids for a 2 story, 100 x 200 ft. dairy and creamery at 42nd St. and Millersville Rd. C. Byfield, Peoples Bank Bldg., Indianapolis. Estimated cost $150,000.

Dairy Building—Thunder Bay Co-Operative Dairy Ltd., Port Arthur, Ont., plans the construction of a dairy on Owen St. Estimated cost $50,000.

Ice Cream Factory—Schwen Ice Cream & Candy Co., Blue Earth, Minn., awarded contract for the construction of a 2 story ice cream factory to J. B. Nelson Construction Co., Mankato. Estimated cost $30,000.

Milk Depot—B. Munday, 322 West 22nd St., New York, N. Y., awarded contract for the construction of a milk depot at 435 West 18th St. to W. C. Tobey, 250 8th Ave., New York. Estimated cost $45,000.

Milk Plant—Chamber of Commerce, Mount Pleasant, Tex., plans the construction of a milk plant. Estimated cost $75,000.

Milk Plant—Silverwoods Dairies Ltd., A. E. Silverwood, Gen. Mgr., Bathurst St., London, Ont., is having plans prepared for the construction of a milk plant on Bathurst St. Estimated cost $100,000. F. F. Saunders, 116 Concord Ave., Toronto, is architect. Complete milk handling equipment, pasteurization, bottling, sterilizing, etc., will be required.

Milk Products Plant—McKenzie Milk Products Co., Trezevant, Tenn., reported, plans addition to plant. Estimated cost $100,000.

Powdered Milk Plant—Texas Milk Products Co., Marshall, Tex., plans the construction of a powdered milk plant. Estimated cost $200,000.

Chewing Gum Factory—Canadian Chewing Gum Co., Ltd., 405 Logan Ave., Toronto, Ont., is having plans prepared for the construction of a 30 x 70 ft. addition to plant.

Fish Factory Addition—F. E. Davis Fish Co., Roger St., Gloucester, Mass., awarded contract for additions and alterations to factory, 1 story, 75 x 95 ft. to W. M. Bailey Co., 88 Broad St., Boston.

Food Plant—The Great Atlantic & Pacific Tea Co., Plainfield St., Springfield, Mass., awarded contract for a 3 story plant including bakery, warehouse, etc., to L. L. Leveque Co., Edgehill Rd., Columbus, O. $500,000; also let contract for a 4 story, 125 x 235 ft. warehouse at Atlanta, Ga., to Thomas A. Monahan Construction Co., 710 Union Title Bldg., Indianapolis, Ind. $200,000.

Food Products Plant—W. K. Kellogg Co., G. McKay, Treas., Porter St., Battle Creek, Mich., awarded contract for a 5 story addition to plant on Stiles St. to M. J. Morehouse, 343 South Dearborn St., Chicago, Ill. Estimated cost $1,000,000.

Fruit Warehouse—New Orleans Fruit House, E. Rosenberg, Mgr., Flint, Mich., is having plans prepared for a 3 story, 70 x 150 ft. fruit warehouse. Estimated cost $200,000. J. W. Cook, Flint, is architect.

Grocery Plant—H. C. Bohack Co., Metropolitan and Flushing Aves., Flushing, N. Y., will build a grocery plant. Estimated cost $60,000. Koch & Wagner, 32 Court St., Brooklyn, are architects. Work will be done by day labor and separate contracts.

Grocery Warehouse—Aratta Bros., 16th and R Sts., Sacramento, Calif., awarded contract for the construction of a 1 story warehouse at 1001 R St., to F. Schlukeber, 2734 Marshall Way, Sacramento. Estimated cost $25,000.

Grocery Warehouse—T. Green Grocer Co., Santa Fe and St. Louis Ave., Kansas City, Mo., plans the construction of a 6 story warehouse. Estimated cost $150,000.

Grocery Warehouse—Magnolia Grocery Co., Magnolia, Ark., plans to rebuild warehouse destroyed by fire. Loss $140,000.

Grocery Warehouse—Western States Grocery Co., Salt Lake City, Utah, awarded contract for the construction of a warehouse to G. A. Whitmeyer & Sons Co., 2759 Grand Ave., Ogden, Utah. Estimated cost $200,000.

Macaroni Factory—Savoia Macaroni Mfg. Co., 63rd St. and 15th Ave., Brooklyn, N. Y., will receive bids after Aug. 1 for the construction of a macaroni factory. Estimated cost $100,000. F. Savignano, 6005 14th Ave., Brooklyn, is architect.

Market Building — J. H. Beattie Co., 717 Moody St., Waltham, Mass., awarded contract for a 1 and 2 story market building at Prospect and Main Sts. to J. E. Griffin Co., 250 Stuart St., Boston. Estimated cost $150,000.

Tea Factory—National Tea Co., G. Rassmussen, Pres., 1000 Crosby St., Chicago, Ill., awarded contract for the construction of a 2 story factory at 3rd Ave. S. and 28th St., Minneapolis, Minn., to Standard Construction Co., 1111 Plymouth Bldg., Minneapolis. Estimated cost $175,000.

Corn Meal Mill—Maritime Corn Meal Co., 30 Hanover St., St. John, N. B., plans the construction of a new mill. Estimated cost $125,000.

Flour Mill—Western Canada Flour Mills Co., Hamiota, Man., plans the construction of a mill. Estimated cost $50,000.

Flour, Feed and Meal Mills—G. E. Conkey, 10307 Detroit Ave., Cleveland, O., reported, acquired Dal-Tex Grain Co., at Dallas, Tex., and plans extensive improvements to double storage capacity, also installing new equipment.

Flour Warehouse—Nickel Plate Development Co., C. Conley, Engr., Terminal Tower, Cleveland, O., awarded contract for a 2 story, 50 x 201 ft. warehouse at 37th St. and Croton Ave. to W. Dunbar Co., 8201 Cedar Ave., Cleveland. Estimated cost $150,000. Pillsbury Flour Mills Co., B. B. Butler, Mgr., 612 Engineers Bldg., Cleveland, lessee.

Grain Elevator—Canada Steamship Lines, Fort Bay St., Toronto, Ont., will receive bids in August for the construction of a grain elevator, 4,000,000 bu. capacity at Kingston. Estimated cost $2,000,000. C. D. Howe & Co., Whalen Bldg., Port Arthur, are engineers. Elevator and conveying equipment will be required.

Grain Elevator—Canadian National R. R., Montreal, Que., plans the construction of a grain elevator, 2,000,000 bu. capacity at Port Huron, Mich. C. S. Gzowski, Montreal, is chief engineer.

Grain Elevator—Chicago, Burlington & Quincy R.R., 547 West Jackson Blvd., Chicago, Ill., awarded contract for a 93 x 100 ft. grain elevator at Wharf and East Grand Ave., St. Louis, Mo., to James Stewart Corp., 343 South Dearborn St., Chicago, Ill. Estimated cost $500,000.

Grain Elevator—Continental Grain Co., A. B. March, Secy. and Treas., 563 Chamber of Commerce Bldg., Minneapolis, Minn., awarded contract for the construction of a grain elevator at 25th Ave. S. E., to Bland Engineering Co., L and Kennedy Sts., Minneapolis. Estimated cost $100,000.

Grain Elevator—Galveston Wharf Co., 2324 Ave. B, Galveston, Tex., will receive bids after Aug. 10 for the construction of a grain elevator, 5,800,000 bu. capacity to include 84 x 232 ft. steel shed, 427 bins, four receiving elevator legs, sixteen double automatic power grain shovels, eight double action Paterson car door removers, automatic fire pumps, electric power motors, etc. Estimated cost $2,000,000. Private plans.

Grain Elevator—Great Lakes Elevator Co., First Ave. W., Owen Sound, Ont., awarded contract for addition to grain elevator, 2,000,000 bu. capacity to Barnett McQueen Construction Co., Cuth Bldg., Fort William, Ont. Estimated cost $400,000.

Grain Elevator—North American Elevator Co., c/o McDonald Engineering Co., Canadian Pacific Bldg., Toronto, Ont., Engrs. and Contrs., will build a 1,000,000 bu. grain elevator at Port Huron. Estimated cost $500,000. Grain conveying and handling equipment will be required.

Grain Elevator — Saskatchewan Elevators, Ltd., Port Arthur, Ont., awarded contract for the construction of a grain elevator to Barnett-McQueen Co., Ltd., May St., Fort William. Estimated cost $1,000,000. Electrically operated elevator and conveying equipment will be required.

Grain Mill—J. B. Ham Co., 19 School St., Auburn, Me., is having plans prepared for the construction of a 2 story grain mill. Estimated cost $40,000. Edward Sales Co., 443 Congress St., Portland, Me., is architect.

Storage Bins—Cascade Milling & Elevator Co., Cascade, Mont., plans the construction of additional storage bins.

Seed Cleaning Plant—Dept. of Public Works, S. E. O'Brien, Secy., Ottawa, Ont., will soon award contract for the construction of a seed cleaning plant at Moose Jaw, Sask.

Stock Feed Mill—Missouri Farmers' Association, c/o J. A. Helbig, Purch. Agt., 540 Benton Ave., Springfield, Mo., awarded contract for the construction of a stock feed mill at Grant Ave. and Phelps St. to Southwest Engineering Co., McDaniel Bldg., Springfield. Estimated cost $50,000.

Cold Storage Plant—S. Steinmetz, 61 School St., Yonkers, N. Y., awarded contract for the construction of a cold storage plant to Lynch & Larkin, 127 Downing St., Yonkers.

Cold Storage Plant and Warehouse—Hardware City Storage Co., Inc., E. W. Shultz, Pres., 551 Stanley St., New Britain, Conn., plans the construction of a 7 story, 50 x 100 ft. cold storage plant and warehouse. Estimated cost $150,000. Architect not selected.

Ice Plant—R. W. Alford, 120 West Craig St., San Antonio, Tex., will soon award contract for the construction of a 50 ton ice plant at Mercedes. Estimated cost $50,000.

Ice and Cold Storage Plant—Central Power & Light Co., Frost Bldg., San Antonio, Tex., awarded contract for the construction of an ice and cold storage plant at Crystal City to Sumner Sollitt Co., National Bank of Commerce Bldg., San Antonio.

Ice Storage Plant—Rubel Coal & Ice Co., S. Rubel, Pres., 937 Fulton St., Brooklyn, N. Y., awarded contract for the construction of a 1 story ice storage plant at E. S. Hoff St. to Gustave Jensen, 8124 11th St., Brooklyn. Estimated cost $20,000.

Refrigeration Plant—Dept. of Public Works, S. E. O'Brien, Secy., Ottawa, Ont., will receive bids until Aug. 2 for the installation of a refrigeration plant in National Research Council Laboratory, Sussex and John Sts., Ottawa.

Refrigeration Terminal—Port of Tacoma Commission, Tacoma, Wash., will soon award contract for the construction of a new refrigeration terminal, 1,000,000 ft. of refrigeration space with provision for handling frozen fruits and berries.

Poultry Plant—Kasser Bros., Roseville, Calif., awarded contract for the construction of buildings and packing house for eggs and poultry products to G. Lindgren, Roseville. Estimated cost $30,000.

Poultry and Egg Plant—Tulsa Poultry & Egg Corp., 932 South Elgin Ave., Tulsa, Okla., reported, plans a 3 story plant at 1431 Detroit Ave.

Packing House (meat)—Roth Packing Co., Waterloo, Ia., awarded general contract for the construction of a 6 story meat packing house to H. A. Meine Co., Waterloo. Estimated cost $350,000.

Packing Plant Addition—Banfield Bros. Packing Co., R. C. Banfield, V. Pres. and Gen. Mgr., 915 East Apache St., Tulsa, Okla., will receive bids about Sept. 1 for a 3 story addition to packing plant. Estimated cost $250,000.

Packing Plant (Meat)—F. B. Baker & Associates, Edinburg, Tex., is having plans prepared for the construction of a packing plant in Texas, location not decided. $100,000.

Packing Plant (Meat)—Stahl Meyer Inc., L. Meyer, 110 East 127th St., New York, N. Y., is having plans prepared for the construction of a 1 story addition to meat packing plant at Cody St. and Wyckoff Ave., Ridgewood. Estimated cost $60,000. Allmendinger & Schlendorf, 852 Monroe St., Brooklyn, N. Y., are architects.

Packing Plant—Swift & Co., U. S. Yards, Chicago, Ill., awarded contract for a 2 story addition to packing plant to J. S. Sweitzer & Son, Inc., 701 Builders' Exchange Bldg., St. Paul, Minn. Estimated cost $45,000.

Packing Plant (Fruit and Vegetable) and Pickle Factory—Libby, McNeil & Libby, 41 Front St., Portland, Ore., will build a fruit and vegetable packing plant and pickle factory at Mount Angel, Ore.

Packing Plant—First Co-Operative Packers of Ontario, W. F. Downey, Secy., Elmvale, Ont., plans the construction of a packing plant at Barrie. Estimated cost $200,000.

Packing Plant—High Grade Packing Co., J. Tramonte, Pres. and Gen. Mgr., 2627 D St., Galveston, Tex., reported, contemplating improving and renovating plant.

Packing Plant Addition—Cudahy Packing Co., 803 Macy St., Los Angeles, Calif., awarded contract for addition to packing plant including 3 story, 45 x 73 ft. hydrogenerating building, 3 story, 47 x 49 ft. lard refinery and 40 x 61 ft. hydrogen plant to Pozzo Construction Co., 421 Macy St., Los Angeles. Estimated cost $70,000.